TITLE OF THE STUDY

EXPLORING INNOVATION WITHIN LOW AND MEDIUM TECHNOLOGY SMEs: A QUALITATIVE STUDY OF IRISH FOOD COMPANIES.

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Submission Date: 11/05/2020.

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ACKNOWLEDGEMENTS

I would like to extend my sincerest thanks to UCC's Management and Marketing Department for providing state of the art facilities, expert advice and assistance during this Management and Marketing Masters by Research. In particular, I would like to express my deepest appreciation to my supervisory team Dr. Lawrence Dooley, Prof. Mary McCarthy, and Dr. Seamus O'Reilly for their invaluable insight, patience and guidance. However, a special thank you must go to Dr. Lawrence Dooley for his instrumental contribution through his constructive advice, knowledge and for going well beyond expectations by providing relentless support that significantly improved the quality of the following dissertation.

ABSTRACT

R&D is a key determinant of innovation and yet Low and Medium Technology (LMT) industries by their definition, do not invest heavily in this driver of innovation. Small and Medium-Sized Enterprises (SMEs) account for the majority of enterprises, contributing significantly to economic output, employment and the regional economy of developed countries. In fact, much of the SME population operate in LMT industries and have continued to survive and grow in the face of market turbulence. Given their economic importance and sustainability, the question of if and how these LMT SMEs innovate is an important one, especially given that they are disadvantaged relative to both the scale and R&D intensity of larger enterprises.

This innovation research concentrates on the largely silent enterprise majority of LMT SMEs (Hirsch-Kreinsen et al., 2005; Dooley et al., 2017; Trott and Simms, 2017; Hullova et al, 2019) to gain better insights into the nature and management of innovation within such firms and the organisational capabilities that nurture their innovation output and continued survival. Encouragingly, numerous innovation researchers have begun to explore the innovation activity of the LMT sector and the SME' within same (Bender and Laestadius, 2005; Kirner et al., 2009; Hansen, 2010; Som and Kirner, 2015; Hirsch-Kreinsen, 2015; Dooley and O'Sullivan, 2018; Flor et al., 2019). This research answers calls by Robertson et al. (2009), Hirsch-Kreinsen (2015), Som and Kirner (2015) and Hullova et al., (2019) for increased study of this largely 'forgotten sector' and how they innovate for survival and growth. In addressing this gap in innovation research, the research employs a qualitative case-based approach that studies seven cases of LMT SMEs within

the food sector in Ireland. Cases were developed through multiple interviews of management team members (including the general manager/owner) across the seven cases that agreed to participate.

The research findings highlight that LMT SMEs innovate for survival and growth and that this innovation activity is primarily incremental in nature. The predominant innovation undertaken by such firms is that of constant process innovation, ensuring continued enterprise efficiency and survival, followed in strategic importance by periodic product innovation that nurtures enterprise growth. The findings highlight that although management of the innovation process is often ad hoc in nature, the centralised decision power within key individuals (e.g. entrepreneurial Managing Director) permits an opportunistic yet focused trajectory to innovation activity. While acknowledging significant resource constraints and low investment in traditional R&D, the research highlights that LMT SME leverage capabilities, both internal within the venture and from external sources to support innovation. The research highlights the importance of the capabilities of collaboration, Managing Director entrepreneurial orientation, deep knowledge of and interaction with the customer base and a learning mode of doing, using and interacting (DUI) as core to their innovation for survival and growth.

The main implications of the research are twofold. Firstly, our findings suggest that LMT SMEs innovate constantly and do so in the absence of traditional R&D and the Science, Technology and Innovation (STI) learning mode of innovation. Governments and policymakers need to give greater attention to their capability development through policies that enhance management capability and their exposure to a wider network of potential collaborators. Secondly, given the entrepreneurial Managing Director influence across the SME organisation, then education, training and mentoring

support of key SME management will nurture innovation for the LMT SME firm survival and growth.

1 CHAPTER ONE - INTRODUCTION TO THE STUDY

1.1 Background of the Study

An organisation's ability to innovate and adapt to its changing external environment is core to its survival (O'Sullivan and Dooley, 2008; Goffin and Mitchell, 2017; Tidd and Bessant, 2018). Acknowledging the importance of this organisational capability and the dominance of research to date concentrating on large scale enterprise, this study seeks to explore *if and how LMT SMEs innovate for survival and growth*. Gaining an understanding of the purpose, types and nature of how LMT SMEs innovate is important, with implications for both innovation theory and policymakers. In this chapter, a brief introduction to the rationale for undertaking this work will be presented. This chapter is organised as follows. Section 1.1 provides an overview of the context of the research. Following this, the study research questions are introduced (section 1.2) and the associated methodological approach outlines (section 1.3). Finally, the chapter concludes by providing an overview of the remaining thesis structure.

Innovation at the organisational level is defined as *"the process by which firms master and get into practice design and manufacturing that are new to them, whether or not they are new to the universe or even the nation"* (Nelson and Rosenberg, 1993, p.4). Its importance is considered critical to firm survival and growth (Acs and Audretsch, 1990; Porter, 1998; O'Sullivan et al., 1998; McGrath and MacMillan, 2000; Heidenreich, 2009; Tidd et al., 2018), a view supported by Chesbrough et al. (2006, p. 89) who claim that *"companies that don't innovate die"*. While much has been written of innovation over the past half-century, three perspectives of innovation dominate, namely those that explore innovation from the perspective of an event, as a process and

a culture\ecosystem (Tidd and Bessant, 2018). While all three perspectives are heavily interrelated, this research aligns with the innovation process perspective (O'Sullivan and Dooley, 2008; Goffin and Mitchell, 2017; Tidd and Bessant, 2018), where events are the outcome of the process and the culture/ecosystem is encompassed within the organisation's capabilities and linkages to its external community.

SMEs are defined as *"enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro"* (European Commission, 2003 p. 5). According to Ayyagari et al. (2007), SMEs are responsible for approximately 60 per cent of employment created in many economies of OECD (Organisation for Economic Co-operation and Development) countries. This highlights the importance of the sector for employment and stimulating economic activity at the level of local economies, the nation of Ireland and the wider European context (Birch, 1989; Storey, 1994; Abdullah and Beal, 2003). In examining levels of firm innovation, the classification of firms warrant attention. The most widely adopted system of classification, adopted by the OECD classifies sectors based on their R&D intensity levels (OECD, 2002). The classification (most relevant to this study) is referred to as 'low-and medium-technology' (LMT), representing firms with R&D expenditure of $\leq$ 3% of turnover annually. A large portion of firms in the LMT classification, in the Irish context, are SMEs and many of these are involved in the food industry. This industry has significant importance to the European economy and is considered the lifeblood of the EU's identity (Committee of the Regions, 1996; Traill and Pitts, 1998; Hirsch-Kreinsen, 2015; Flor et al., 2019). Its importance is particularly evident for job creation (i.e. 11% of total employment), economic growth and production (Christensen et al., 1996; Traill and Pitts, 1998;

Hansen and Winther, 2011). The LMT sector is dominated by mature SMEs (Pavitt, 1984; Nouman et al, 2011), operating within traditional and well-established sectors pf national economies. If measured in terms of output, level of capital invested or rates of employment, LMT sectors within both developed and developing economies are of strategic significance (Sandven et al., 2005). Thus, the study of the sustainability and growth of LMT SMEs is something of importance for regional, national and European economies.

When examining the innovation literature, the LMT sector is often overlooked by researchers, with the majority of innovation research focusing on the innovation performance of large firms in High Tech (HT) classifications and R&D as the main determinant of innovation performance (Becheikh et al. 2006; Patel et al. 2008; Barge-Gil et al. 2008; Som, 2012; Love and Roper, 2015; Dooley and O'Sullivan, 2018; Hullova et al., 2019). The attraction of R&D as innovation determinant is due to the ease, simplicity and precision of its measurability (Jacobson and Heanue, 2005; Godin, 2006; Som 2012; Dooley and Som, 2018) and its attraction to policymakers as the single, encompassing measurement. Yet, the majority of SMEs are not HT firms but instead LMT, where, by definition of the sector, R&D is not a significant focus of their innovation activity. While of obvious importance, R&D is not the only determinant of organisational innovation contributing to sustainability and it is acknowledged *"that R&D [narrowly defined] accounted for only a fraction of total innovation costs"* (Sterlacchini, 1999, p. 819). Thus, the innovation efforts of this silent majority of LMT SMEs have been neglected by a '*high-tech myopia*' (Hirsch-Kreinsen et al., 2005; Dooley et al., 2017; Trott and Simms, 2017; Hullova et al, 2019) and has contributed to the fallacy that they are not innovative and are of less important, especially in developed economies (Turok, 2004; Hansen, 2010; Hirsch-Kreinsen, 2015). Promisingly, over the last decade, several

innovation researchers have begun to turn attention towards the innovation activity of the LMT sector and the SME' within same (Bender and Laestadius, 2005; Kirner et al., 2009; Hansen, 2010; Som and Kirner, 2015; Hirsch-Kreinsen, 2015; Dooley and O'Sullivan, 2018; Flor et al., 2019). While existing innovation management literature highlights the importance of R&D for firm survival and growth (Som and Kirner, 2015), LMT SMEs, despite low investment in R&D exhibit long life cycles and have been responsible for the development of a wide range of innovations supporting survival and growth (Patel et al. 2008; Barge-Gil et al. 2008; OECD, 2015; Hullova et al., 2019). This indicates a capability to innovate without R&D. Thus, R&D intensity levels are an unsuitable measurement of all innovation intensity (Avermaete et al., 2004; Hirsch-Kreinsen, 2015).

1.2 Objectives of the Study

As outlined above, this research aims to explore *if and how LMT SMEs innovate for survival and growth*. This study answers calls for research by Robertson et al. (2009), Hirsch-Kreinsen (2015), Som and Kirner (2015) and Hullova et al., (2019) to build on the understanding of this largely neglected or *'forgotten sector'*. In addressing this objective, the research explores three related sub-questions, explored in the context of LMT SMEs within the Irish food sector.

The first research question asks:

"Do LMT SMEs innovate to facilitate survival and growth?"

In addressing this question, the research applies Tidd and Bessant's Four P's of Innovation Space to analyse if innovation is evident within this category of SME and if so, then what types of innovation are occurring. Following on from this, the second research question seeks to address:

"How do LMT SMEs manage their innovation activity?"

In addressing this question, the research applies Tidd and Bessant's Innovation Process Model to explore the process and nature of innovation management within LMT SMEs, something not fully understood within the literature (Maggitti, Smith, and Katila, 2013). The final and third research question investigates:

"*What capabilities underpin LMT SMEs ability to innovate to facilitate survival and growth?"*

In addressing this question, the research applies propositions distilled from literature best practice (see chapter two) relating to the capabilities that nurture LMT SMEs innovation activity and output. The collective insights from the study of these three sub-research questions will inform our understanding of the innovation activity of LMT SMEs that underpin their continued survival and growth, especially given their low R&D reliance as a determinant for innovation.

1.3 Research Approach

This research employs a qualitative case-based approach (Stake, 1995; Yin, 2017). This is considered the most suitable research method when there is a lack of prior research in an area (Eisenhardt, 1989; Yin, 2017). This research approach facilitates a comprehensive understanding of the key informant's perceptions to gain insights into something not yet entirely understood (Bell, 2014), namely how LMT SMEs continue to survive in the absence of R&D.

The research sample focused on SMEs operating within the Irish food industry and undertook semi-structured interviews with members of the senior management teams of appropriate cases, supported by secondary data. Seven food LMT SMEs, from a larger target population within the

Munster region, became the basis for this qualitative study. These include firms that employ between 10 – 249 employees, have a total revenue of between €5,000,000 and €40,000,000 per annum, have been operating for greater than 5 years, sell products in both national and international markets, and manufacture or package their goods on their premises. In each case, interview respondents were the general manager/owner and at least one member of the upper-level management team (nominated by the general manager/owner), since these key informants possess the holistic insights not only of the 'what' innovation was undertaken by their LMT SME but also the 'why' and 'how' rationale of the innovations undertaken. The targeting of these key respondents was deemed appropriate since they are *"considered to be influential, prominent, and/or well informed in an organisation or community; they are selected for interviews on the basis of their experience in areas relevant to the research"* (Marshall and Rossman, 2014, p. 155). Undertaking multiple interviews within each case also enhanced the reliability of the research and helped counteract any individual bias on the part of the researcher.

1.4 Overview of the Thesis

Following on from this introductory chapter, chapter two presents a critical analysis of the innovation and SME literature relevant to the LMT SMEs context. Chapter three describes the research methodological choices made in undertaking this investigation. It outlines the research paradigm, the specific method adopted to address the research questions and the data analysis approach gathered in the research sites. Chapter four presents a comprehensive analysis of the data gathered and produces findings that provide a deeper insight into innovation practices of LMT SME context. Chapter five discusses these findings, leveraging the literature of chapter 2 to delve deeper into their theoretical and managerial implications. Lastly, chapter six presents the main

conclusions of the research study and the insights gleaned through the study of the three related sub-research questions. The chapter concludes by highlighting the contribution of these conclusions, together with the limitations of this research and recommendations for future research.

2 CHAPTER TWO - LITERATURE REVIEW

2.1 Introduction

In the following chapter, a review of the existing body of literature on innovation management in SMEs is presented, providing the theoretical background necessary to interpret the subsequent case studies. The review is divided into two main sections including 1) the context of the research and 2) the themes of the research. This section concludes by bringing together the previous sections and providing a concise synopsis of the literature review in its entirety.

2.2 Context

This section of the literature review provides the context for this study. Firstly, the importance of SMEs for employment and the economy is considered (Birch, 1989; Storey, 1994; Oslo Manual, 2005; van de Vrande et al., 2009; Hansen and Winther, 2011). Secondly, this section discusses the importance of innovation for the survival and growth of the LMT SME sector (Acs and Audretsch, 1990). Thirdly, the importance of the LMT classification is outlined, due to a gap in the literature that fails to accurately measure innovation in LMT SMEs as these firms have been largely neglected by a *'high-tech myopia'* (Hirsch-Kreinsen et al., 2005; Dooley et al., 2017; Trott and Simms, 2017; Flor et al., 2019). Lastly, the context of the food sector SMEs and their role in the Irish and European economy is discussed.

2.2.1 Small and Medium-Sized Enterprises

The European Commission defines SMEs as *"enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet total not exceeding 43 million euro"* (European Commission, 2003 p. 5).

Table 1: Small and Medium-Sized Enterprise Definition by the European Commission.

Enterprise Category	Headcount: Annual Work Units (AWU)	Annual Turnover	Annual Balance Sheet Total
Medium	< 250 and >50	< / = €50,000,000	< / = €43,000,000
Small	< 50 and >10	< / = €10,000,000	< / = €10,000,000
Micro	< 10	< / = €2,000,000	< / = 2,000,000

Source: European Commission, 2005 p. 14.

The importance of SMEs in Ireland is undeniable as they account for 99.8% of the total number of firms and 65% of total employment (CSO, 2016). While large organisations are responsible for 61% of GVA (gross value added) in the business economy, SMEs remain a significant contributor as they account for 39% GVA (CSO, 2016). SMEs in Ireland contribute a total of 31% of Irish exports (CSO, 2016). Therefore, a significant role is played by SMEs in supporting economic activity (Birch, 1989; Storey, 1994; Abdullah and Beal, 2003; Ayyagari et al., 2007).

2.2.2 Organisational Innovation

Organisational innovation, as highlighted in the previous section is considered by Acs and Audretsch (1990) to be crucial to the survival and growth of the SME sector. Examining the innovation of SMEs requires a broad definition of innovation that does not depend on the R&D intensity level of a firm in isolation (OECD, 1997; Raymond and St. Pierre, 2010). Thus, for the

purpose of this study, organisational innovation is defined as *"the process by which firms master and get into practice design and manufacturing that are new to them, whether or not they are new to the universe or even the nation"* (Nelson and Rosenberg, 1993, p.4). This definition avoids any bias towards STI and R&D.

While innovation does not guarantee success due to its uncertainty, it should be viewed as an *'ally'* to firm survival and growth (Porter, 1998; McGrath and MacMillan, 2000). According to Tidd et al. (2001, p. 12), "*unless organisations are prepared to renew their products and processes on a continuing basis, their survival chances are seriously threatened"*. SMEs operating in sectors such as the food industry consistently alter and change their manufacturing processes and market offerings to facilitate continued survival (Lagace and Bourgault, 2003). Thus, SMEs ability to develop new products and processes is crucial to their survival and growth as it is the very core of value creation for the sector (Acs and Audretsch, 1990). This brings us onto our discussion of the LMT classification, given its significance to the SME sector.

2.2.3 Low and Medium Technology Classification

The system of classification, implemented by the OECD, classifies industries based on their R&D intensity levels (OECD, 2015). In innovation research, 'low-technology' refers to an industrial sector that has no or low levels of investment in R&D. This category indicator is based on the R&D investments made by firms, in proportion to their revenue or the value of the output of their specific industry. Four categories are used. The first indicator categorises sectors with R&D expenditures of greater than 5 per cent of overall revenue as *'high-tech'* or *'high-technology'* (HT). Secondly, those with R&D expenditures of between 3 and 5 per cent are categorised as *'medium-*

high-tech' or *'complex technologies'*. Thirdly, sectors that spend between 3 and 1 per cent on R&D activities are categorised as *'medium-low-tech'*. Lastly, sectors with an R&D expenditure lower than 1 per cent are classified as *'low-tech'*. The final two classifications (most relevant to this study) are typically combined and therefore referred to as *'low-and medium-technology'* (LMT), representing firms with R&D expenditure of ≤ 3% of turnover annually. R&D activities are characterised as being novel; creative; uncertain; systematic; transferable; and/or reproducible (OECD, 2015). It is defined as an activity that "c*omprise[s] creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge" (OECD, 2015, p. 44).*

The LMT classification is dominated by mature SMEs (Pavitt, 1984; Nouman et al, 2011) that operate within well established and traditional sectors such as food, publishing and print, wood and furniture, as well as the manufacturing of metal and plastic products. In comparison, many organisations classified as *'high-tech'* and *'medium-high-tech'* operate in sectors such as pharmaceuticals, electronics, vehicle and aerospace construction, and large parts of mechanical engineering (Oslo Manual, 2005).

The LMT classification is perceived as *'old fashioned'* and out of date, irrespective of the highly complex procedures and large amounts of capital required within this classification. LMT firms are regularly associated with media taglines such as *'rust belt'*, irrespective of the classification's importance to economic well-being (Hirsch-Kreinsen et al, 2006; Santamaria et al, 2009; Spithoven et al, 2010; Som and Kirner, 2015). When comparing HT with LMT classification, LMT

firms often have slower growth rates and exist in more highly saturated markets with higher amounts of price competition (Avermaete et al., 2004; Weidner and Som, 2015). However, if measured in terms of output, level of capital invested or rates of employment, LMT firms appear dominant in highly developed and developing economies alike (Sandven et al., 2005).

Often cited in the literature is the idea that the determinants of innovation in LMT industries are often not recognised by the OECD definition (von Tunzelmann and Acha, 2005; Dooley, and Som, 2018). Typically, policymakers emphasise R&D expenditure, the numbers of qualified scientists or engineers (QSEs) and the number of R&D staff employed in an organisation to measure and assess the innovativeness of firms (Hoffman et al., 1998; Albaladejo and Romijn, 2000) due to the ease, simplicity and precision of its measurability (Jacobson and Heanue, 2005; Godin, 2006; Hullova et al., 2019). However, these measurements are limited since evidence highlights how R&D expenditure fails to accurately measure innovation in SMEs (Love and Roper, 1999).

Scholars such as Pavitt (1984) developed a taxonomy that outlines the ability to innovate through skilled employees doing, using and interacting (DUI) mode of innovation to overcome the limitations of this measurement of innovation. Nevertheless, this taxonomy has had little effect on policymakers (Jacobson and Heanue, 2005) as industries with low levels of R&D expenditure are continually classified as being less important for the growth of an economy by the European Union (Hirsch-Kreinsen, 2005). Yet, the success of the LMT classification in developed western countries cannot be ignored (Hirsch and Kreinsen, 2008) as this *'low-tech'* categorisation by no means refers to firms that do not innovate. In fact, the opposite is suggested as they are innovative in a quite specific manner (Som, 2012). Thus, the continued competitiveness of the LMT

classification in the EU has gained the attention of numerous researchers (Bender and Laestadius, 2005; Kirner et al., 2009; Hansen, 2010; Hirsch-Kreinsen et al., 2015; Trott and Simms, 2017), particularly in the context of innovative organisations.

2.2.4 Innovation in LMT SME Context.

In measuring and understanding innovation, the classification of firms has led to a concentration of research into HT firms with less attention given to LMT firms (Heidenreich 2009; Hirsch-Kreinsen, 2015; Love and Roper, 2015; Dooley and O'Sullivan, 2018). This is problematic if we consider what firm innovation means and the significant contribution of LMT firms to the economy and indeed the longevity of such firms. In considering innovation as defined previously, the definition takes a better account of firm activity across the spectrum from HT to LMT.

According to Jacobson and Heanue (2005, p. 315) *"learning and innovation can take place without R&D, for example through the acquisition of tacit and practical knowledge, and through formal and informal diffusion between firms'"*. This tacit and practical knowledge is derived from deeply rooted and strong connections to an external network who continuously contribute to an organisation's innovation efforts and improved performance (Oslo Manual, 2005; von Tunzelmann and Acha, 2005; Patel et al., 2008). LMT firms are understood to be *"supplier dominated firms... [and] are characterised by strong dependencies on the external provision of machines, equipment and software"* (Pavitt, 1984, p. 343–373). They, therefore, play an integral role as purchasers of HT firm innovations such as advanced machinery and equipment that often requires practical, experience-based knowledge, not recognised by the R&D indicator (Robertson et al., 2009). This taxonomy has perhaps led to the perception that the innovativeness of LMT

SMEs may be underappreciated by scholars as a consequence of the technological expertise often purchased through either informal or formal means from HT firms (Hirsch-Kreinsen et al., 2006). This highlights the interdependence of the innovation ecosystem as it is anticipated that there may be a reduction in demand for innovative HT products if innovation is neglected in more mature LMT classifications. Thus, according to Robertson et al. (2003), there is a risk that the level of R&D activities for HT firms could also decline. This reliance is becoming increasingly prevalent as technology sourcing is becoming more important for LMT firm's innovation activities (Heidenreich, 2009; Santamaria et al., 2009).

Furthermore, LMT firms are characterised *"by process, organisational and marketing innovations, [and] by weak internal innovation capabilities"* (Pavitt, 1984 p. 343 - 373). As a percentage of turnover, LMT organisations relative expenditure on process innovations is similar to that of HT firms (Sandven et al., 2005; Heidenreich, 2009; Kirner et al., 2009; Hullova et al., 2019). Importantly, this suggests that LMT firm's development activities occur on the production line or internally within a production plant rather than in a research centre involving the application of previously existing knowledge rather than the new knowledge generation required of R&D.

Albaladejo and Romijn (2000 pp. 4-5) state that *"informal and incremental problem solving and experimentation takes place on the shop floor and are closely associated with production. This is the case in small companies that do not have the resources and organisation to mount large R&D and human resource development programmes."* This is supported by Frishammar et al. (2013) who suggest that the product and process development of LMT organisations occur simultaneously, with frequent contributions made by equipment manufacturers and engineers

through a DUI mode of innovation to limit risk and minimise uncertainty. This brings us onto our discussion of the Food industry, given its importance to the Irish economy in terms of employment and the significant growth potential of this indigenous sector.

2.2.5 The Food Industry

SMEs in the food industry are frequently characterised as being low tech, non-R&D intensive and mature (Christensen et al., 1996; Grunert et al., 1997; Hullova et al., 2019). However, this industry has significant importance to the European economy in terms of job creation (11% of total employment), economic growth and production (Christensen et al., 1996; Traill and Pitts, 1998; Hansen and Winther, 2011). The majority of the early literature on firm innovation within the food sector is case focused on large organisations (Christensen et al. 1996; Huiban and Bouhsina, 1998) in part due to them fitting within the HT classification. However, as highlighted earlier, the majority of SMEs engage in a DUI mode of innovation with food firms being no exception. For this reasons, it is perhaps more appropriate to explain innovation through the DUI mode of innovation (Jensen et al., 2007; Lundvall, 2010) since it is suggested that the innovation strategies adopted by food sector firms exist in the form of step-by-step product development, product refinements, expert production processes and product customization (Hirsch-Kreinsen, 2008; Som and Kirner, 2015). Thus, food sector LMT SMEs have been responsible for the development of a wide range of product and process innovations (Avermaete et al., 2004; Santamaria et al, 2009; Som and Kirner, 2015). Francis et al. (2008) in their study of innovative activities of the food industry, described the sector as having a high level of volume output with a high degree of diversity in new product development (NPD).

Furthermore, a cost minimisation attitude is reflected in price-based competitiveness, in part due to the changing dynamics of the European food industry as industry control has shifted from the producer to the retailer (Van Trijp and Steenkamp, 1998). Therefore, enhancing the efficiency and effectiveness of the production process is given considerable attention to food firms. However, the high cost of new technologies (Bunduchi and Smart, 2010) constrains the development and progress of food firm's innovation activities due to the aforementioned industry stimulus.

Lastly, reflected in the literature is the interconnectedness between food sector products and packaging, something not typically evident to the same extent in other industries. Food industry organisations are increasingly engaging in packaging innovation to further differentiate from competitors and enhance their performance (Wells et al., 2007; Mahalik and Nambiara, 2010, Trott and Simms, 2017). Packaging is a *'priority issue'* when it comes to product innovation (Koss, 2007, p. 132), in part, due to (i) concerns for the environment (Prendergast and Pitt, 1996; Thøgersen, 1999; Rundh, 2005); (ii) increasing costs of transportation and distribution (Lockamy, 1995; Rundh, 2005); and (iii) competition from own-brand products among retailers (Burt, 2000; Vazquez et al., 2003).

2.3 Themes

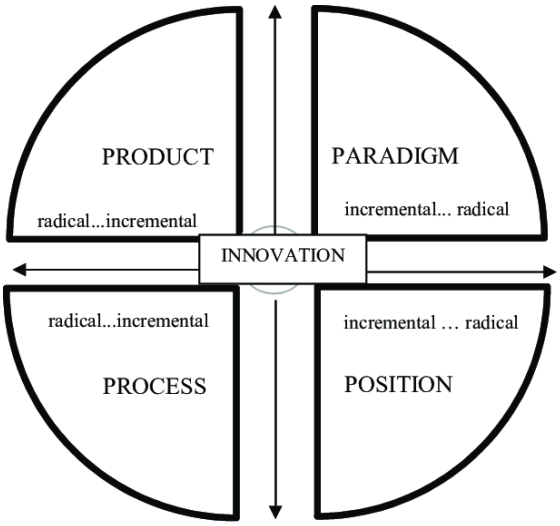
This section considers the themes relevant to this study. Firstly, this includes a review of the literature on the types of innovation and how the innovation process is managed. This is followed by a discussion, in a *'hierarchical'* manner, of the literature on the Resource-Based View (RBV) of the firm and the extended RBV. Throughout the discussion, resources are referred to as the

'first-order' component of this hierarchy, capabilities are referred to as the *'second-order'* and dynamic capabilities are the *'third-order'* component.

2.3.1 Types of Innovation

There have been various classifications of the types of innovation proposed by researchers. The earliest model was proposed by Knight (1967) who referred to four types of innovation: organisational structure, production process, people, and product/service. Since then, numerous models have been proposed by scholars, each with their nuances (e.g. Evan, 1966; Knight, 1967; Damanpour and Evan, 1984; Damanpour, 1987; Oke et al., 2007). One of the most accepted categorisations in recent decades is that put forward by Tidd and Bessant (2005), defining four distinct innovation types (see figure 1). These are product innovation; process innovation; position innovation and paradigm innovation (Tidd and Bessant, 2005). Each innovation type strengthens and supports the others and can be characterised as traversing across a spectrum from incremental to radical (Bessant and Tidd, 2007).

Figure 1: Innovation Space.



Source: Tidd and Bessant, 2013, p. 25.

LMT SMEs are understood to engage in a range of innovation types. In particular, product and process innovations and are often characterised by incremental innovations given their resource constraints (Avermaete et al., 2004; Hirsch-Kreinsen et al, 2006; Santamaria et al, 2009; Hervas-Oliver et al, 2011; Spithoven et al, 2010; Som and Kirner, 2015). For the remainder of this section, we will delve deeper into the elements of this model.

2.3.1.1 Product Innovation

Product innovation is defined as *"the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user-friendliness or other functional characteristics"* (Oslo Manual, 2005 p. 48). The majority of scholars agree that effective product innovation is crucial to the success of firms operating within manufacturing industries (Cooper and Kleinschmidt, 1996; March-Chorda et al., 2002; Cormican and O'Sullivan, 2004). However, it is suggested that the high failure rate associated with new food

product launches (Cormican and O'Sullivan, 2004) has reduced the radicalness of product innovations as established organisations frequently choose to incrementally redevelop existing products to increase the likelihood of product success (Kristensen et al., 1998; Iiori et al., 2001; Hisrich-Kreinsen, 2015; Trott, and Simms, 2017). This incremental product innovation is more conservative and occurs much less frequently than in HT firms (Hervas-Oliver et al, 2011; Rammer et al., 2009; Som, 2012; Hirsch-Kreinsen, 2015). Additionally, these incremental innovations are heavily skewed towards the existing capabilities of LMT SMEs that rely on internal resources that are owned and controlled by the firm (Som and Kirner, 2015). This struggle for novelty is reinforced by the resource constraints that exist for LMT SMEs.

Customer responsiveness is considered the main driver of product innovation for the LMT classification, highlighting its reactive nature. This is underpinned by the advantages associated with LMT SMEs as they have close touchpoints with their customers that allow for knowledge gathering, responsiveness and innovative experimentation (Hisrich-Kreinsen, 2015). LMT SMEs can capitalise on this proximity to their customers due to their flexibility and knowledge built up over years of intense interaction (Som and Kirner, 2015).

LMT firms rely on internal knowledge (Cormican and O'Sullivan, 2004), organisation agility and market trends as catalysts of product innovation, rather than discovery knowledge of R&D as is the case in HT firms (Lindman, 2002). While LMT SMEs in the food sector don't typically engage in R&D, R&D activities do, in some cases, contribute to product innovation, mainly through collaborations with external organisations such as research centres and government agencies, or in

scenarios of outlier firms within the LMT classification that have pursued a knowledge-intensive strategy where R&D activity is nurtured (Som, 2012).

Lastly, product innovations frequently result as a consequence of both process and position innovations (Tidd and Bessant, 2018). These types of innovations are discussed in more detail in the following sections.

2.3.1.2 Process Innovation

The second type of innovation, process innovation, refers to improvements in how products are created and delivered (Bessant and Tidd, 2018). According to the Oslo Manual (2005 p. 49), process innovation is "*the implementation of a new or significantly improved production or delivery methods which includes significant changes in techniques, equipment and/or software"*. It facilitates a beneficial change in the methods that products can be processed and delivered, accounting for the introduction of new equipment to change the process of how raw materials can be converted into final products (Bessant and Tidd, 2007). Process innovation is the most frequently engaged innovation type in LMT SMEs (Galizzi et al., 1996; Avermaete et al., 2004; Laforet and Tann, 2006; Capitanio et al., 2010; Triguero et al., 2013) and is similar to that of high tech firms. This is explained by the fact that R&D is not as central to process innovation as it is to product innovation (Kirner et al., 2009).

Process innovations within the LMT context are understood to be incremental (discussed in more detail later) due to the resource constraints of SMEs that inhibit the exploitation of opportunities derived from more novel technologies (Le Bars et al., 1998). Furthermore, Som (2012) suggests

that process innovations are driven out of necessity to remain competitive. The process innovations of LMT SMEs are characterised by heavy customisation of bespoke equipment, highlighting the tacit knowledge of the workforce and the purchase of second-hand machinery and equipment, reflected in the deep relationships with these suppliers (Hirsch-Kreinsen, 2015).

2.3.1.3 Position Innovation

Position Innovation is defined as *"incremental changes in the context in which products/services are introduced"* (Bessant and Tidd, 2007 p.13) and involves the firm changing the position of the product within a new or existing market, thereby changing the meaning of the product from the perspective of the consumer (Kim and Mauborgne, 2000). An example of a position innovation outlined by Francis and Bessant (2005) was the demographic shift targeted by Haagen-Dazs ice cream from children to targeting adults. Thus, position innovations are closely linked with marketing activities since organisations can take the same product and repackage it to market and promote it to a new demographic. It is suggested that the organisation's ability to engage in position innovation has increased over the past number of years, in part due to the improvements in marketing capabilities by developing deep attachments to products among consumers through more accurate customer profiling techniques (Francis and Bessant, 2005).

Position innovations are also closely linked to internationalisation which are increasingly common due to increased globalisation by breaking down barriers between countries as evident in the European Union's single market and customs union. In the context of LMT SMEs, this form of position innovation poses numerous challenges due to the resource constraints of these firms in terms of finance, technology and human resources. Nevertheless, numerous benefits influence

firms to engage in position innovation. Firstly, increasing the number of domestic markets and international markets accessible to the firm increases the potential of increasing firm revenue. Secondly, diversifying product offerings and the number of markets served ensures the firm is less dependent on any particular market. Lastly, position innovations often require increased production that leads to greater economies of scale and therefore improved profit margins.

2.3.1.4 Paradigm Innovation

Paradigm Innovation refers to a change in the structure of how a firm is organised, thereby, framing what the organisation does (Bessant and Tidd, 2015). This is understood as a change in the firm's business model including a fundamental shift in its market focus and is used by the firm's management to understand the organisation and shape its future for survival and growth (Senge, 1992). According to Rickards (1999), *"the term paradigm has found its way into the vocabulary of organizational management, in such terms as 'paradigm switch' and 'paradigm breakthrough'. The expressions are broadly taken to imply that a traditional belief system - the old paradigm - has been replaced by a new way of understanding, a new paradigm"*. It is suggested by Francis and Bessant (2005) that the most considerable forms of business model reconfiguration include firm acquisitions, mergers, joint ventures and alliances. These innovations emerge as a result of the identification of ineffective operational processes rather than a strategic orientation and aims to reorganise the firm to achieve greater value. In the case of SMEs, it is understood that this approach to paradigm innovation is largely to provide a sufficient resource base to engage in innovation. However, engagement in paradigm innovation among LMT SMEs is quite limited, due to the risk associated with changes in how a firm is organised. Additionally, paradigm innovations are the result of major changes in both the firm's operations and strategy (Francis and Bessant,

2005) meaning it often demands significant levels of resources and capabilities not frequently evident in SMEs (Winters and Stam, 2007). Therefore, it is suggested that paradigm innovations are more suited to larger organisations (Hartley et al., 2013) that can appropriately manage the paradigm innovation.

2.3.2 Rate of change of Innovation

All four types of innovation are categorised as being either incremental or radical (Bessant and Tidd, 2007). Incremental innovation can be defined as a step-by-step process in which innovations develop slowly by *"doing what we do but better"* (Bessant and Tidd, 2007, p. 22). They *"involve endless minor modifications and improvements in existing products, each of which is of small significance but which, cumulatively, are of major significance"* (Rosenberg, 1994, pp. 14-15). Radical innovation, on the other hand, is defined as a comprehensive and extreme change in the organisation by *"doing something completely different"* (Bessant and Tidd, 2007, p. 22). Schumpeter described radical innovations as *'gales of creative destruction'* that can make existing product and process solutions obsolete in numerous sectors (Avermaete et al., 2004). According to Rosenberg (1994), radical innovations are often highly uncertain as firms attempt to discover opportunities that have yet to be uncovered. Thus, unsurprisingly incremental innovation rather than radical innovation is much more frequently practised by LMT SMEs (Laforet and Tann, 2006; Oke et al., 2007; Hirsch-Kreinsen, 2008; Forsman and Rantanen, 2011).

Von Hippel (2005) suggests that incremental innovations are often realised due to improvements made by producers themselves highlighting the importance of an organization's employees for incremental innovations. Employee education and skills are central to dealing with the challenges

when innovating (Toner et al., 2004). Furthermore, incremental innovations are usually predictable in terms of expenditure, resource requirements, and are necessary to continuously respond to ever-changing customer trends and competitors (Helfat and Winter, 2011). LMT firms consistently optimise their processes and technologies as an alternative to pursuing more radical and risky innovation activities (Bunduchi and Smart, 2010). While incremental innovation reduces risk exposure due to increased chance of market adoption, it also limits the resulting novelty of outcome and the ability to differentiate and capture high value as a result. It is suggested that this is the case as LMT SMEs are constrained by a lack of resources that can be leveraged to engage in radical innovation (Von Hippel, 1988; Cohen and Levinthal, 1990; Rothwell, 1991; Freel, 2000; Lawson and Samson, 2001; Romijn and Albaladejo, 2002; Laursen and Salter 2006; Hervas-Oliver et al., 2011). Additionally, low-profit margins from commodity-based market offerings often reinforce this scenario. However, irrespective of this, it is argued by Scott-Kemmis (2004) that incremental innovations are the main cause of an increase in economic productivity due to increased optimisation of processes.

2.4 Change and Innovation Process Management.

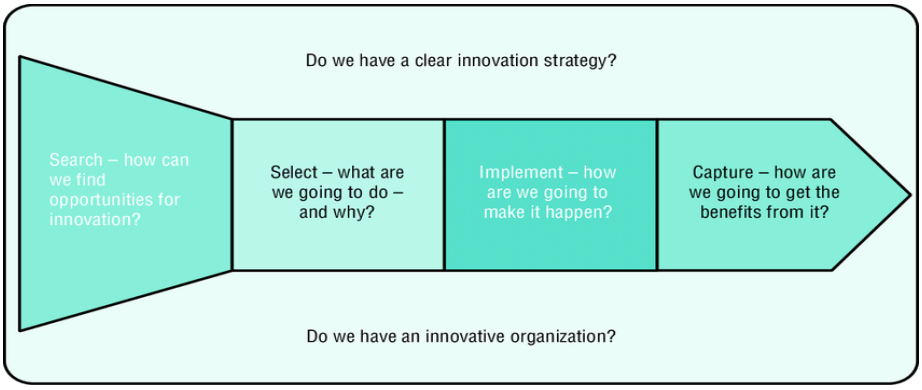
Moran and Brightman (2001) define change management as a *"process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers"*. Numerous models and theories have been developed that support managers and entrepreneur's efforts to manage change in internal and external environments (Van Ossten, 2006). According to Pierce, Gardner, and Dunham (2002), change is either reactive (internal or external elements force a change) or proactive (change is desirable). Change is often viewed as a process that involves a series of events, focusing on the different steps

to implement a change. Scholars have attempted to enhance the change management of firms, yet have been largely unsuccessful. Additionally, Robertson et al. (2009), Hirsch-Kreinsen (2015), and Trott and Simms (2017) call for an in-depth study on the change management of the LMT classification since research on large scale firms "*do very little to enhance knowledge of the process"* by which change management occurs (Robertson et al., 2009, p. 445).

The Innovation Process Model developed by Tidd and Bessant (2005) is frequently used in innovation management. This model is defined as *"the process of converting ideas into a state of reality and then capturing value from them"* (Bessant and Tidd, 2013, p.21). Edquist (1997, p. 1) claims that innovation *"by no means follows a 'linear' path from basic research to applied research and further to development and implementation of new processes and new products. Instead, it is characterised by complicated feedback mechanisms and interactive relations involving science, technology, learning, production, policy and demand"*. Thus, the model outlined by Tidd and Bessant (2005) is based on the fundamental idea that the majority of innovations are developed using a rational and coherent progression with regular steps, processes and practices among different types of products and industries (Von Zedtwitz, Friesike, and Gassmann, 2014). Throughout these steps, a review and analysis of innovation occurs to decide whether or not to continue or cease innovation development. Therefore, the number of projects becomes smaller as the innovations move through the innovation process model (Cooper, 2011). The innovation process model has four main stages including search, select, implement, and capture value. Different skill sets are required to enhance and improve innovation outputs at different stages of the innovation process; creative individuals are often considered vital for the development of innovation projects in the early stages, while the marketing department or marketing individuals

are central in stages of commercialisation (Herrmann and Peine, 2011). Refer to the innovation process model in figure 2.

Figure 2: Innovation Process Model



Source: Tidd and Bessant, 2013 p. 47.

Within this model, firm innovation strategy and resources are also considered. Innovation strategy reflects how management focuses on several areas such as addressing market trends, the role of technology and matching resources to strategy. The innovation process model poses two main questions: 1) *'do we have a clear innovation strategy'* and 2) *'do we have an innovative organisation?'*. It is widely argued that the strategies of LMT SMEs are ad hoc, implicit (Hirsch-Kreinsen and Jacobson, 2008; Som and Kirner, 2015) and lack a formalised structure (Hoffman et al., 1998; March-Chorda et al., 2002) that impacts their productivity, effectiveness and efficiency (Hirsch-Kreinsen and Jacobson, 2008; Prakash and Gupta, 2008; Santamaria et al., 2009; Tidd and Bessant, 2018). While it is suggested that this flexibility in the context of LMT SMEs can be interpreted as a competitive advantage, it is also a vulnerability as LMT SMEs can become dependent on a few key individuals such as the entrepreneur, which can hinder growth. Hence, an

implicit and emergent strategic orientation is evident in SMEs and is often embedded in the entrepreneur's tacit knowledge (Heidenreich, 2009).

The innovation strategies of LMT SMEs also depend on the resources available to the firm. In the context of LMT SMEs, these include human resource constraints along with financial constraints. These constraints limit the number of innovation projects, as firms do not have sufficient resources to take on multiple projects across the four Ps of innovation space (Tidd and Bessant, 2018). This influences the ad hoc and implicit innovation management process of LMT SMEs, as described above. This also impacts the firm's degree of innovation (Hirsch-Kreinsen, 2015; Som and Kirner, 2015). Thus, an incremental and conservative approach to innovation is often reflected in LMT SMEs. Additionally, it is these resource constraints that prevent LMT SMEs from engaging in a wide range of R&D projects evident in larger firms where R&D is the main determinant of innovation (Som and Kirner, 2015). Thus, LMT SMEs collaborate with organisations in their external environment to share resources across boundaries and tap into the knowledge, experience and expertise (Weidner and Som, 2015). For the remainder of this section, we delve deeper into the four phases of the model by which innovations come to fruition.

2.4.1 Search

The first phase within Tidd and Bessant's Innovation Process Model *"is concerned with searching and scanning for the position of competitors, potential opportunities and threats within the organization's internal and external environment in an attempt to identify a market niche* (Tidd et al., 2005 p. 349). The *'search'* phase aims to meet market demands and satisfy the needs of stakeholders by identifying new opportunities an organization can exploit through value-added

offerings (Tidd and Bessant, 2013; Lopez-Vega et al., 2016). This is achieved by developing routines that provide structure for organisations to increase their ability to identify and absorb more precise knowledge regarding market and customer's needs. However, it is not enough to solely identify the need, as routines must be implemented to communicate knowledge and information through the entire organisation (Tidd et al., 2005).

Day and Schoemaker (2005) found that effective SMEs continuously monitor their industry environment, changing tastes, and skills to review and examine their competitive advantage through an external lens. It is generally accepted that along with internal capabilities, SMEs depend on formal and informal external sources of information throughout the innovation process (Freel, 2000; Propris, 2000; Romijn and Albaladejo, 2002; Tether, 2002). This brings us to the topic of open innovation, where firms have begun to leverage knowledge generated from external sources (Chesbrough, 2012; Dooley, and O'Sullivan, 2018). Information is shared across boundaries and ideas are exchanged, leading to an increase in innovation novelty (Zaltman, 1986; Menon and Varadarajan, 1992; Han et al., 1998; Im and Workman, 2004). The benefit for SMEs engaging in open innovation is reflected in their ability to harness external resources from diverse sources to support a wide range of innovation activity and not just NPD (Barge-Gil, 2010; Huang et al., 2010). The resources of an organization go further than the resources it owns and controls as it also includes the resources and capabilities that can be leveraged through collaborative links established with external partners (Hoffman et al., 1998; Dodgson, 1991; Weidner and Som, 2015), therefore improving innovation performance (Freel, 2000; Romijn and Albaladejo, 2002; Tether, 2002).

The innovation process is frequently described as being *`user-dominated'* (e.g. von Hippel 1978; Shaw 1998; Propris, 2000; Freel, 2000; Romijn and Albaladejo, 2002; Heidrenrich, 2009). This highlights the need for putting product and service consumers at the beginning of the *'food chain'* (Von Hippel, 1978; Lord, 1999; Hullova et al., 2019). Entrepreneurs spend a significant amount of time searching for sources of knowledge and information that uncover the needs of customers (Slater and Narver, 1998; Cormican and O'Sullivan, 2004). While much of the literature highlights the dangers of ignoring customer's needs, there is often caution highlighted in listening to these needs too closely through an over-dependence on customer feedback and proposals for innovation (Christensen, 1997; Christensen and Anthony, 2004). This is the case as these *'lead users'* can lead manufacturers to make alterations and provide specific solutions that only satisfy their specific needs. Additionally, it is suggested that a user dominated approach could potentially constrain the search for novel solutions to current problems (Verganti, 2011). Thus, it is important to note that while the search process is seen as a vital activity within organisations, it is an activity that is not fully understood within the literature (Maggitti, Smith, and Katila, 2013).

2.4.2 Select

The second phase of the innovation process model focuses on *"the strategic selection of ideas that have been generated by the organisation in the first phase… the main factor that successful organisations take into account is to select ideas that are core to the organization's mission or vision and to avoid or reduce the selection of high-risk ideas.*" (Tidd et al., 2005, p. 89-91). According to Tidd et al. (2005), this phase is critical to the innovation process model since neither large nor small organisations have the necessary resources to explore all opportunities generated in the first phase and therefore must select the most advantageous ones (Laforet, 2008). LMT

SMEs are characterised by a culture of informal, unstructured and reactive decision-making processes (Pullen et al, 2009). Thus, a wide range of innovations is selected based on changing trends and market demands (Hirsch-Kreinsen, 2008; Terziovski, 2010; Tidd and Bessant, 2018). Further, LMT SMEs tend to select short term innovation projects that require fewer firm resources and expose the firm to lower degrees of risk (Hullova et al., 2019).

The selection of ideas often involves analysis and refinement of the product or service concept, while ensuring the potential expenses, market opportunity, and the competencies necessary to execute on the concept are understood (Tidd and Bessant, 2013). This is especially the case when ideas selected are not core to current business activities (Day and Schoemaker, 2004). Thus, rather than innovations being selected at one single phase, the developing portfolio and concepts are periodically assessed based on additional knowledge acquired by the firm through implementation development (Cooper and Kleinschmidt, 1996).

2.4.3 Implement

The third phase within the innovation process model *"focuses on the implementation of ideas generated and selected by the organisation to progress. It focuses on turning ideas into reality through the application of resources such as time, finance, and staff"* (Tidd et al., 2005, p. 349). At this stage, the firm is confident that the product or service idea will add value to customers and that the project will provide a return on the investment made (Tidd and Bessant, 2013; Klingebiel and Rammer, 2014). This phase includes several stages such as acquiring, executing, launching and sustaining. Acquiring refers to the firm obtaining the necessary resources, knowledge and skills necessary to implement the innovation. Executing refers to the firm delivering on the project

idea and typically requires a period of problem-solving in an unpredictable environment. Launching includes the management of innovation through the stages of market adoption. Sustaining refers to the adoption of innovation in the long term, including changes in innovation in the future. It is suggested by Alsaaty (2011) that innovation should be implemented into the culture and daily routine of a firm rather than for once off or specific events due to the benefits associated with the innovation process.

According to Tidd et al. (2001), implementing innovation is a major difficulty for entrepreneurs and SMEs. In particular, SME food product failure rates highlight a challenge in market entry (Stewart-Knox and Mitchell, 2003; Trott and Simms, 2016) due to constantly changing customer tastes, improved technologies, economic fluctuations, competition and scarce resources. It is suggested that these challenges have resulted in open innovation partnerships (Dooley and O'Sullivan, 2018). Further, this phase proves to be a major challenge due to the difficulty in project management and ensuring proposed time scales are achieved. Lastly, it is suggested that LMT SMEs, based on their resource constraints, have limited absorptive capacity to realise learning from innovations (Cohen and Levinthal, 1990; Vega-Jurado et al., 2008; Hervas-Oliver et al., 2011). Thus, to compete effectively, SMEs must improve its innovation process by developing appropriate strategies, technology, and innovative culture to remain competitive for the future (Mosey et al., 2002).

2.4.4 Capture Value

The fourth and final phase of the innovation process model *"concerns capturing value from the product or service idea. This phase focuses on how a firm can ensure the time, effort and finance*

invested in the project has been justified based on monetary appraisals or in terms of social value-added. It concerns the need to review the innovation process to ensure the idea identified, selected, and implemented can't be easily imitated" (Tidd et al., 2005 p. 349) and to ensure the organisation's learnings can be applied as a best practice for the next innovation (James, Leiblein, and Lu, 2013). The value captured by food sector SME innovations is closely associated with the competitiveness of the industry as firms search to increase efficiency, productivity, profit, and market share through innovation (Neely et al., 2001; Freel and Robson, 2004). However, despite the adoption of these models by numerous firms, 90% of food products fail in the first year (Traill and Grunert, 2012). According to Burnes (2004), a manager's failure to appropriately manage change is a major inhibitor for improving firm competitiveness. Thus, to date, there has been a high failure rate among a range of change programmes (Kotter, 1996; Huczynski and Buchanan, 2001).

2.5 Resource-Based View

While management of the process generates innovation outputs, it is the organisational resources and capabilities that enable both management of the innovation process and the activities that flow through same. Edith Penrose was one of the first scholars to identify the value of an organization's resources (Penrose, 1959), considered the *'first-order'* component of the hierarchy. Following this research by Penrose, numerous scholars have been inspired to probe her initial ideas further. Barney (1991 p. 101), considered an authority on resources, defined an enterprise's resources as *"all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness"*. Resources are physical (e.g., specialized equipment, geographic

location), human (e.g., expertise in chemistry), and organizational (e.g., superior sales force) assets that can execute a value-creating strategy for an organisation (Barney, 1991; Wernerfelt, 1995; Slack and Lewis, 2002).

Building on the work of earlier scholars (Penrose, 1959; Wernerfelt, 1984; Hitt and Ireland, 1986), Barney (1991) provided the first framework that links resources to sustained competitive advantage. The topic of the RBV of the firm outlines how the accumulation of valuable, rare, inimitable and non-substitutable (VRIN) resources is the foundation for firm competitiveness and *'economic rent'* (Barney, 1986; Dierickx and Cool, 1989; Peteraf, 1993). Barney (1997) first made amendments to the VRIN framework following observations from numerous scholars that ownership of resources is not always required to establish a competitive advantage since external resources can be leveraged for advantage provided some level of control such as power, influence, or a contract is exerted. This resulted in the consideration of open innovation. Thus, in an attempt to amend the VRIN framework, Barney (1997) claims that competitive advantage is achieved through resources that are valuable, rare, difficult to imitate (non-substitutable) and the firm must be appropriately organised to exploit and deploy its resources, known as the VRIO framework.

While Penrose (1959) in her early work referred to capabilities, the main focus of the RBV stressed the importance of resources and largely ignored organisations capabilities. Therefore, Penrose's research is criticised as it largely ignores the human interaction and managerial importance within an organisation. Barney (1991) argues that resources that meet the requirements of the VRIN framework can be of little to no advantage when controlled by incompetent individuals, who fail to leverage resources appropriately to successfully achieve the firm's goals. Thus, this research

focuses on the capabilities of the organisation and not solely on its resources. Additionally, there is substantial evidence to suggest that SMEs rely heavily on behavioural features or traits when innovating (Helfat and Winter, 2011).

2.6 Capabilities

The firm's *'capabilities'* are the *'second-order'* element of this hierarchy and are defined by Makadok (2001) as a special type of resource that is non-transferable, firm-specific, and integrated into the enterprise, whose objective is to enhance the effectiveness of the other resources accessible to the organisation. This element of the hierarchy was first introduced by Grant (1991) and builds on the RBV of the firm. Since then, numerous strategic management researchers have been committed solely to organisational capability literature (Amit and Schoemaker, 1993; Nelson, and Winter, 2000; Helfat and Winter, 2011). The enterprise's capabilities can organize, arrange and deploy its resources to provide an opportunity to achieve a competitive advantage through improved organisation performance (Slack and Lewis, 2002; Winter, 2003; Borch and Madsen, 2007). It is suggested that *"capabilities cannot easily be bought; they must be built"*, similar to resources, competences and dynamic capabilities (Teece., 2019, p. 15). These capabilities are further understood as *"complex bundles of skills and accumulated knowledge, exercised through organizational processes, that enable firms to coordinate activities and make use of their assets*" (Day, 1994, p. 38). It is suggested that significant value is derived from the organisation's capabilities as they are considered exclusive and difficult to imitate, leading to a direct competitive advantage (Barney, 1991; Baden-Fuller, 1995). Amit and Schoemaker (1993 p. 35) distinguish between *'resources'* and *'capabilities'* by outlining how *"capabilities refer to a firm's capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end."*

Thus, as previously mentioned, an organization's capabilities can create economic value and improve innovation performance only after an organisation has adequate resources in its possession (Amit and Schoemaker, 1993 p. 35), regardless of the quality of firm capabilities. This reinforces the importance of the views and ideas forwarded by Penrose (1959).

2.7 Dynamic Capabilities

This brings us onto our discussion of the *'third order'* component of the hierarchy (Winter, 2003) referred to as *'dynamic capabilities'* which is grounded in the evolutionary theory of the firm (Nelson and Winter, 1982). Dynamic capabilities were first defined as *"the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments"* (Teece et al., 1997, p. 516). They attempted to *"explain how combinations of competences and resources can be developed, deployed, and protected"* (Teece et al., 1997, p. 510). The developing dynamic capabilities view (Teece, 2007) enhances the static nature (Priem and Butler (2001, p. 33) of the RBV, and is considered a response to a request by Barney (1991) and Grant (1996) to address the issue of human and managerial implications on resources (Kraaijenbrink et al., 2010). The core argument of these academics is that static resources do not lead to a competitive advantage while dynamic capabilities do (Eisenhardt and Martin, 2000; Teece, 2007).

Dynamic capabilities have been classified into three categories of activities and adjustments including *"sensing, seizing, and transforming"* (Teece et al., 2007, p. 10). The first category is known as *'sensing'* is the identification and assessment of new opportunities while monitoring changes in the business environment. The second category is termed *'seizing'* and refers to the

mobilization of resources to capitalise on an opportunity that is presented. The third category is known as '*transforming'* and emphasises the consistent renewal of the organisation's resources. It is suggested that these capabilities are essential to the survival of an organisation in the long-run (Teece, 2007).

The majority of the literature discusses dynamic capabilities in the context of large, diversified, multinational organisations in international environments (Zollo and Winter, 2002; Teece, 2007). However, the description of how an organisation utilises its dynamic capabilities in contrast to *'ad hoc'* problem solving reinforces the *'blurry line'* evident in the literature (Hirsch-Kreinsen et al., 2008). This brings us to the topic of '*ad hoc'* problem solving (Winter, 2003) as organisations often have to deal with unanticipated problems. Thus, organisations are often forced into a *'firefighting mode'*, characterised by fast-paced, dynamic, and exploitative pursuits of superior alternatives. *'Ad-hoc'* problem solving is distinguished from dynamic capabilities as they predominantly involve little to no repetition or routine. Therefore, both *'ad hoc'* problem solving and dynamic capabilities are two alternative methods of how an organisation can implement or adapt to change (Eisenhardt and Martin, 2000).

2.8 Innovation Capability

While there is a lack of agreement on how innovation capability is defined. A definition by Hogan et al. (2011, p. 1266) offers a good basis for consideration of innovation capability as *"a firm's ability, relative to its competitors, to apply the collective knowledge, skills, and resources to innovation activities related to new products, processes, services, or management, marketing, or work organization systems, in order to create added value for the firm or its stakeholders."*

Innovation capability is considered to be a dynamic capability (Teece et al., 1997; Sáenz et al. 2009) that is widely accepted to have a positive effect on organisations performance and survival (Banbury and Mitchell, 1995), while also contributing to economic value (Goswami and Mathew, 2005, p. 372).

In terms of innovation, consideration needs to be given to key capabilities that underpin LMT SME innovation since these capabilities can have a vital impact on a firm's survival and growth (Krasnikov and Jayachandran, 2008; Krasnikov and Jayachandran, 2008; Wu, 2013; Hullova et al., 2019). Researchers have identified numerous capabilities that underpin firm innovation that is either static, dynamic or creative such as collaboration capabilities (Hoffman et al., 1998; Romijn and Albaladejo, 2002; Hirsch-Kreinsen et al., 2005; Hervas-Oliver et al., 2011), marketing capabilities (Hirsch-Kreinsen, 2008; Robertson et al., 2009; Heidenreich, 2009; Kirner et al., 2009; Santamaría et al., 2009), entrepreneurial capabilities (Bamberger et al., 1990; Bessant et al., 2007; Hirsch-Kreinsen, 2008), and learning capabilities (Rosenberg, 1982; Jensen et al., 2007; Hirsch-Kreinsen, 2008; Som and Kirner, 2015). Each of these capabilities is discussed in turn.

2.8.1 Collaboration Capabilities

There is a growing body of literature on open innovation as a paradigm for the management of innovation (Chesbrough, 2003; Gassmann, 2006; Dooley and O'Sullivan, 2018). *'Open innovation'* is defined by Chesbrough (2012, p. 20) as *"the use of purposive inflows and outflows of knowledge to accelerate internal innovation and expand the markets for external use of innovation"*. Current innovation literature suggests that companies seldom innovate in isolation (Propris, 2000; Freel, 2000, 2004; Romijn and Albaladejo, 2002; Tether, 2002). The implication

of this has meant that a large portion of organisations is altering their process of *'research and develop'* towards a *'connect and develop'* approach (Huston and Sakkab, 2006).

The capacity for open innovation of LMT SMEs in the food sector is often underestimated, given they perform no or low levels of R&D activities (Christensen et al., 1996; Grunert et al., 1997; Martinez and Briz, 2000). It is suggested that these firms have limited internal innovation capabilities in accessing and absorbing external knowledge (Jones and Craven, 2001; Vega-Jurado et al., 2008; Barge-Gil, 2010; Huang et al., 2010; Hervas-Oliver et al., 2011) in part, due to the limited R&D expenditure of LMT SMEs. Thus, the absorptive capacity of SMEs is often overlooked and is regularly considered a weakness (Cohen and Levinthal, 1990; Mowery et al., 1996; Vega-Jurado et al., 2008; Hervas-Oliver et al., 2011).

Currently, the debate on low-tech innovation patterns has involved an increased number of studies that provide evidence of open innovation practices in LMT SMEs (Van de Vrande et al., 2009; Brunswicker and Vanhaverbeke, 2011). A study by Fitjar and Rodríguez-Pose (2013, p. 137) on food sector organisations in Norway supports the importance of collaboration as they found how *"firms which engage in collaboration with external agents tend to be more innovative than firms that rely on their own resources for innovation"*. It is suggested that these collaborations with external entities enhance innovation activity both in the short and long run for the organisation (Clausen et al., 2012) by outweighing the negative aspects associated with smaller firms (Maskell, 2001). These negative aspects are mainly ascribed to *'resource poverty'* (Mohr and Spekman, 1994; Hoffman and Schlosser, 2001; Davila et al., 2003) such as a deficiency in finance or management skills (Martin and Staines, 1994). According to Adams (1982 p. 76), "*the indispensable and*

compelling need is for small firms to seek external advice and information to fill the void in management expertise and resources". Additionally, according to Hirsch-Kreinsen et al. (2005, p. 23) *"external collaboration helps in overcoming the limitations of a firm's own resources and know-how in developing new production and innovation potential"*. Thereby, reaping the benefits often associated with larger organisations by achieving a similar innovation performance in comparison to large firms (Nieto and Santamaria, 2010; Tomlinson and Fai, 2013).

Networks are repeatedly suggested as being vital to SMEs as *'suppliers, customers, industry associations, competitors'* and in certain cases universities (Hervas- Oliver et al., 2011). These networks can support SMEs overcoming barriers and constraints (Von Hippel, 1988; Lawson and Samson, 2001; Katila and Ahuja 2002; Romijn and Albaladejo, 2002; Hausman, 2005; Adams et al., 2006; Laursen and Salter 2006) and are considered crucial to the SME due to the limited information these enterprises can acquire in isolation (Romijn and Albaladejo, 2002). Furthermore, these interactions with suppliers support information acquisition regarding new technologies, equipment and market changes (Freeman, 1991, 1995; Rothwell and Dodgson, 1991; Panda and Ramanathan, 1996; Edquist, 1997; Lundvall, 2010). It is widely agreed that this is of vital importance in determining firm competitiveness and innovation capability as LMT SMEs are significant purchasers from HT firms (Garibaldo and Jacobson, 2005; Santamaria et al., 2009). This is the case since the average manufacturing firm in the UK spends over 50 per cent of its expenditure on *'bought-out items'* (Turnbull *et al*. 1992). The impact of this high dependency on suppliers of equipment and machinery means that the majority of LMT SME innovation is incremental rather than being radically novel.

Findings from a survey carried out on food companies in the UK and the USA provide evidence that innovation also depends on the network relationships developed with retailers (Hoban, 1998; Sloane and O'Reilly, 2013). Gaining input from retailers has become important to the success of innovations (Knox et al., 2001; Stewart-Knox et al., 2003) while dependence on other external partners such as consultants, and research centres have decreased. This is the case since collaborations with universities and research centres typically require high levels of expertise and absorptive capacity, often lacking in LMT SMEs. This impacts the innovation novelty of LMT SMEs since collaborations with customers and suppliers are more likely to be incremental, while the lack of engagement with universities and research centres reduces the likelihood of radical innovation output. While partnerships with research centres are considered vital for innovation in LMT SMEs (Hervas-Oliver et al., 2011) since they are typically unable to conduct their R&D without support (Von Hippel, 1988; Baardseth et al., 1999; Katila and Ahuja 2002; Laursen and Salter 2006), evidence of this remains limited. Massa and Testa (2008) in their study found that SMEs tend to prefer links with suppliers and customers as opposed to universities and research institutes. Furthermore, LMT SME collaborations with external entities tend to be informal (Nouman et al, 2011) and often in the form of non-equity collaborations.

The literature warns that while external networks are important, one cannot neglect the significance of internal capabilities and resources as the most fundamental elements of innovation performance within the enterprise (Kim and Nelson, 2000; Freel, 2002). Furthermore, external collaborations can support SMEs development of internal capabilities (McEvily and Zaheer, 1999; Lee et al., 2001) and enhance innovation efforts (Caloghirou et al., 2004; Hanel and St-Pierre,

2006; Vega-Jurado et al., 2008; Albors-Garrigos et al., 2009). This brings us onto the discussion of LMT SMEs marketing orientation.

2.8.2 Marketing Orientation

Market orientation is defined as *"the detection and fulfilment of needs and wants of potential customers using skills, resources and competences of the company"* (Traill and Grunert, 2012, p. 1). It refers to an organization's ability to anticipate the needs of current and future customers through effective knowledge acquisition and in turn utilise this knowledge to improve marketing planning, investment and implementation to exploit future opportunities (Vorhies et al., 2009; Su et al., 2013; Wu, 2013). Day (1994, p. 41) outlines how market orientation is an outside-in process that connects *"...organizational processes to the external environment… [while] creating durable relationships with customers, channel members, and suppliers"*. The marketing orientation is considered central to innovation activity (Day, 1994), in particular for product and process innovations (Le Bars et al., 1998) in food sector LMT SMEs (Earle, 1997; Grunert et al. 1997; Borch and Forsman, 2001).

LMT SME researchers propose that innovation is a market-driven process that relies on market information and understanding to develop new products, increase market share and grow (Hirsch-Kreinsen, 2008; Robertson et al., 2009; Grimpe and Sofka, 2009; Kirner et al., 2009). Empirical work carried out by von Hippel (2005) provides detailed explanations of how consumers can take on partner-style roles which help support the identification of future needs and trends. LMT innovation strategies are frequently characterised as being *'customer-oriented'* or *'market-driven'* (Santamaría et al., 2009; Santamaria, Nieto, & Barge-Gill, 2009; Hirsch-Kreinsen, 2012) as these

partners are increasingly important for innovation (Von Hippel, 2005; Gassmann, 2006). Superior marketing capabilities enhance product and position innovations (Grunert et al., 1997; Steward-Knox and Mitchell, 2003; Hirsch- Kreinsen, 2008; Robertson et al., 2009; Grimpe and Sofka, 2009) through a deeper understanding of customer purchasing habits that enables firms to recognise problems, needs and wants (Hirsch-Kreinsen, 2004; Tunzelmann and Acha, 2005; Hirsch-Kreinsen, 2008; Heidenreich, 2009; Wu, 2013). Thereby, reducing the likelihood of market failure (Le Bars et al., 1998; Steward- Knox and Mitchell, 2003). Furthermore, this capability has a profound impact on the firm's competitive advantage (Morgan et al., 2009; Vorhies et al., 2009) since marketing capabilities are considered less vulnerable to imitation due to their implicit and idiosyncratic nature (Krasnikov and Jayachandran, 2008).

2.8.3 Entrepreneurial Orientation

The entrepreneur's recognition in innovation literature was first established in the work of Schumpeter (1939) and has been continuously re-emphasised (Earle, 1997; Grunert et al.1997; Mascitelli, 2000; Borch and Forsman, 2001). According to Schumpeter, an entrepreneur refers to a *"person who creates new combinations… who sees how to fulfil currently unsatisfied needs or perceives a more efficient means of doing what is already being done"* (Kamien and Schwartz, 1982). Pérez-Luño et al. (2011) studied 400 Spanish firms and found that innovation is strongly linked with entrepreneurial orientation. The attention-based theories of the firm (Simon 1979; Ocasio 1997) highlight how managerial attention is one of the most significant resources available to the firm as it is valuable, rare and inimitable. This is largely reflected in LMT SMEs as the owner or entrepreneur is considered more influential than in large organisations (Mascitelli, 2000)

since strategic decision making of LMT SMEs is led by the entrepreneur (Bamberger et al., 1990; Hirsch-Kreinsen, 2008).

LMT SMEs often pursue customer-oriented, step-by-step strategies by bundling their resources (e.g. knowledge) in a small few key individuals within the organisation (e.g entrepreneurs and upper-level managers). According to Hirsch-Kreinsen et al. (2008), these key individuals often provide insight and have in-depth knowledge about particular aspects of the innovation activity. Furthermore, much of the present literature suggests that the origin of innovation is identified through the workforce's imagination, creativity and skills (Hotho and Champion, 2011).

Entrepreneurship is frequently associated with creativity, value creation and risk-taking (Bessant et al., 2007). The impact of the entrepreneurial orientation on LMT SMEs innovation performance is reflected in organisations risk-taking and proactiveness since these characteristics are often responsible for igniting the innovation process (Le Bars et al., 1998; Borch and Forsman, 2001; Romijn and Albaladejo, 2002; Pérez-Luño et al., 2011). Further entrepreneurial characteristics include the ability to show weaknesses, accept mistakes and change approach when necessary even if it leads subordinates, peers, and superiors to believe errors were made (Weir and Őrtenblad, 2013). It is suggested that the entrepreneurial orientation determines a SMEs innovation output as entrepreneurs have a broad understanding and overview of the enterprise and can make decisions quickly due to few barriers and little bureaucracy (Bamberger et al., 1990). Alternatively, larger enterprises are often governed by "*more complex and often pluralistic decision-making structures"* (Bamberger et al., 1990, p. 3).

It is suggested that a clearly constructed mission, vision, and set of goals can significantly improve an organization's ability to innovate (Christenson and Walker, 2004; Considine et al., 2009, p.28) as *"creative people invest themselves and their identity in the mission being pursued. As a result, missions both direct and motivate creative efforts. This rather straightforward set of observations, however, has an important, albeit often overlooked, implication: viable missions, as defined by leaders, must be embedded in the environment – both the organizational and technological environment"* (Mumford et al., 2009, p. 280). Thus, the vision established by the entrepreneur is the foundation for the organisation's aims and strategies that play a critical role in motivating the workforce to generate new ideas, meet the needs of customers, and to increase innovation output (Lawson and Samson, 2001; Smith et al., 2008; Sloane, 2017).

2.8.4 Learning Capabilities - DUI

Learning processes have been described by Keeble and Wilkinson (1999) as the absorption of information that creates and integrates knowledge throughout the organisation. This signifies the importance of the social and communicative ability of the workforce. Learning assists in the formation of organisation routines, practices, and accepted standards. Knowledge, whether generated internally or externally, is often considered the most valuable asset to the innovation process as it sets the foundation to deploy, develop, or dispose of the resources and capabilities available to organisations in dynamic environments (Ndofor and Levitas, 2004, Cormican, 2007). This outlook has been manifested from the resource and capability view of the firm (Wernerfelt, 1984; Barney, 1991; Peteraf, 1993) and is now considered to form the knowledge-based view of the firm (Grant, 1996).

Jensen et al. (2007) have distinguished *'Science, Technology and Innovation'* (STI) and '*Doing, Using, Interacting'* (DUI) modes of innovation. It is suggested that LMT SMEs predominantly depend on DUI to innovate. Learning by doing reflects the firm's ability to improve efficiency and productivity in terms of performing certain routines or tasks through repetitive practices which is vital for firm innovation activity (Gatignon and Xuereb, 1997; Tether, 2002; Koberg et al., 2003). The knowledge necessary for innovation in LMT SME is often characterised as practical knowledge, such as everyday experience and incremental problem solving developed over some time through DUI (Albaladejo and Romijn, 2000; Hirsch-Kreinsin, 2015). This is the case since LMT SMEs pursue little to none of their R&D activities (Mascitelli, 2000; Jensen et al., 2007). Thus, the impact of this reliance on the DUI mode of innovation is reflected in the incremental nature of innovations among LMT SMEs (Hirsch-Kreinsen, 2008).

Learning by using is supported by the acquisition and use of advanced manufacturing technologies (Rosenberg, 1982; Gatignon and Xuereb, 1997) that entrepreneurs, managers, engineers, and marketers engage and interact within a trial and error and experimental fashion (Wuyts et al., 2004; Hirsch-Kreinsen and Jacobson, 2008; Santamaria et al., 2009; Som and Kirner, 2015). Advanced manufacturing technology is a significant driver of the innovative output for LMT SMEs (Sohal et al., 2006), particularly with changes to products, improved production output, reduced cost, more effective management of staff, and increased flexibility (Hofmann and Orr, 2005). Pavitt's taxonomy illustrates how LMT firms are supplier dominated, suggesting they re-configure external technology sourced from suppliers to enable its functionality in a new environment (Hansen and Winther, 2011). According to Pavitt (1984, p. 356) "*most innovations come from suppliers of*

equipment and materials". These novel technologies ignite opportunities for LMT SMEs which improve their innovation capabilities and performance (von Tunzelmann and Acha, 2005).

Learning by interacting reflects both interactions within the firm and also external interactions with entities outside of the organisation (Kline and Rosenberg, 1986; Chipika and Wilson, 2006). These interactions with customers, suppliers, and other third parties are essential to LMT SMEs learning process as they *"often provide knowledge that initiates learning processes leading to concrete innovation measures in companies"* (Hirsch-Kreinsen et al., 2008, p. 14).

2.9 Concluding Remarks

To conclude, while SMEs play a major role in generating economic activity (Birch, 1989; Storey, 1994; Abdullah and Beal, 2003; Oslo Manual, 2005; Hansen and Winther, 2011), researchers have largely neglected the innovation trajectory of this sector (Robertson et al., 2009; Hirsch-Kreinsen, 2015; Hullova et al., 2019) by applying an unsuitable measurement of innovation (Barge-Gil et al. 2008; Patel et al. 2008; Hirsch-Kreinsen, 2015). However, there is widespread agreement that LMT SMEs in the food sector is responsible for the development of a wide range of innovations when innovation is defined as *"the process by which firms master and get into practice design and manufacturing that are new to them, whether or not they are new to the universe or even the nation"* (Nelson and Rosenberg, 1993).

LMT SME innovation output is considered to be incremental, with little evidence of radical innovation in the literature. It is suggested that process innovations are central to LMT SME innovation activity. While the literature also suggests that these firms engage in product

innovation, its importance is not as prevalent. The literature reflects little to no evidence of position or paradigm innovation. Further, a review of the literature suggests that the LMT SME innovation process is defined by implicit and ad-hoc approaches to innovation management (Hirsch-Kreinsen and Jacobson, 2008; Santamaria et al., 2009; Som and Kirner, 2015).

While LMT SMEs absorptive capacity is often overlooked, due to their lack of R&D expenditure (Cohen and Levinthal, 1990; Mowery et al., 1996; Vega-Jurado et al., 2008; Hervas-Oliver et al., 2011), it is suggested that they innovate by relying on collaborative capabilities (Bender and Laestadius, 2005; Rammer et al., 2009; Huang et al., 2010; Barge-Gil, 2010). Thus, LMT SMEs leverage the resources and capabilities of external firms to reduce their resources constraints and improve firm competitiveness (Propris, 2000; van de Vrande et al., 2009; Hervas-Oliver et al., 2011). The market orientation and understanding of LMT SMEs is also considered a key innovation activity that is in part, driven by customer-focused and practical knowledge (Hirsch-Kreinsen, 2004; Tunzelmann and Acha, 2005; Hirsch-Kreinsen, 2008; Heidenreich, 2009). Additionally, the literature highlights the entrepreneur as being key to the innovation trajectory of the firm due to their tacit knowledge and the implicit strategies that guide the organisation and facilitate flexibility and responsiveness to emerging opportunities in dynamic environments. Lastly, the literature suggests that the learning capabilities of LMT SMEs are defined by a DUI approach to innovation due to the firm's entrepreneurial orientation and their tacit knowledge and experience-based know-how that often facilitates incremental problem solving within these firms (Albaladejo and Romijn, 2000).

3 CHAPTER THREE - RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this chapter is to systematically present the logic behind the methodological choices used to address the research questions. The chapter presents the rationale for applying an exploratory case study research strategy and focuses on the case study companies. Each of the data collection tools and sources is discussed with a special focus on how semi-structured interviews were applied to gather appropriate primary data. Attention is given to the important issue of research philosophy and how an epistemological perspective guides how we view knowledge, thus directing our research activity. Additionally, recognition of the limitations of our work is also discussed. The chapter concludes by providing the rationale behind the theoretical sampling procedure employed and by addressing concerns about validity, reliability and generalisation.

As outlined above, this research aims to explore if and how LMT SMEs innovate for survival and growth. Thus, answering calls from scholars such as by Robertson et al. (2009), Som and Kirner (2015), Hirsch-Kreinsen (2015), and Trott and Simms (2017) to build on the understanding of this largely neglected classification. To address this objective, the research seeks to explore three related questions. Each research question is asked in the context of LMT SMEs within the Irish food sector.

The first research question:

"Do LMT SMEs innovate to facilitate survival and growth?"

uses Tidd and Bessant's Four P's of Innovation Space to consider if innovation is evident and if so, what types of innovation are present. The second research question:

"How do LMT SMEs manage their innovation activity?"

uses Tidd and Bessant's Innovation Process Model to explore the process and nature of innovation management within SMEs, something not fully understood within the literature (Maggitti, Smith, and Katila, 2013). The third research question:

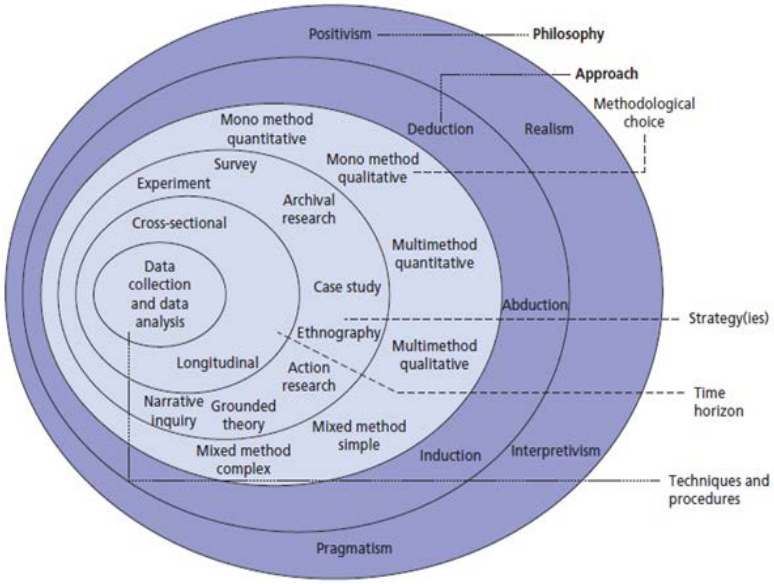
"*What capabilities underpin LMT SMEs ability to innovate to facilitate survival and growth?",*

uses propositions developed from a preceding literature review relative to the capabilities supporting LMT SMEs innovation activity and output, presented in chapter two. By addressing these three research questions, we explore the nature of LMT SMEs innovation ability, survival and growth, especially given their low reliance on R&D as a lever for innovation.

3.2 Research Design

According to Blaikie (2007 p. 205) "*there is no perfect way to conduct research… The researcher's task is to choose the research strategy that best fit(s) the investigation of the research problem at hand, the research question that expresses it, while at the same time recognising these limitations*". The research onion (figure 3), adapted from Saunders, Lewis and Thornhill (2012) outlines the methodologies and methods available to researchers.

Figure 3: Research Onion



Source: Saunders, Lewis and Thornhill, 2012.

For a graphical representation of the methodological choices made during this study, see figure 4 below.

Figure 4: Flowchart of Methodological Choices.

3.3 Research Philosophy

Research philosophy is defined as an *"overarching term related to the development of knowledge and the nature of that knowledge"* (Saunders et al., 2012, p. 101). Creswell (2013 p. 16) goes further to describe a research philosophy as *"the use of abstract ideas and beliefs that inform our research"* and guide the researcher's actions. Creswell (2013) argues that the research study starts with the researcher (what do they offer, their background, and their experiences). Denzin and Lincoln (2000 pp. 2-3) highlight that *"the bricoleur (qualitative researcher) understands that research is an interactive process shaped by his or her personal history, biography, gender, social class, race and ethnicity, and those of people in the settings"*. Thus, like all human conduct, academic research too is based overtly or otherwise, on some philosophical outlook.

An understanding of the philosophical positioning of research helps researchers identify diverse research designs and approaches as well as for deciding which is most appropriate for the study at hand (Easterby-Smith, 1991). The literature describes two main research philosophy positions when researching the area of business management including; ontology and epistemology. Firstly, ontology is concerned with the understanding of the nature of reality (Saunders et al., 2012). The investigator's assumptions about this nature of reality influence every aspect of the research study (Crotty, 1998). Ontology involves researchers taking a scientific approach. This involves the distinguishable feature that the natural world is genuine in existence, can be analysed impartially, and that existing universal patterns can be understood as theories or laws (Maylor and Blackmon, 2005 p.142). Throughout this section, two aspects of ontology are discussed including; constructivism and objectivism. Both are generally accepted by scholars to produce valuable research outputs. Constructivism maintains that *"social phenomena and their meanings are continually being accomplished by social actors. It implies that social phenomena and categories are not only produced through social interaction but are also in a constant state of revision"* (Bryman and Bell, 2015 p. 33). Objectivism has been succinctly defined by Bryman and Bell (2015 p. 32) as an ontological position where the *"social phenomena and their meanings have an existence that is independent of social actors. It implies that social phenomena and the categories that we use in everyday life have an existence that is independent or separate from actors"*.

Secondly, epistemology is concerned with the nature of knowledge and is characterised by the notion that the natural world is influenced by personal feelings, experience, and opinion, rather than on fact (Maylor and Blackmon, 2005, p145). This is typically applied by researchers conducting a qualitative approach. In the analysis of qualitative research, there are ten distinct

theoretical traditions determined throughout the literature such as; ethnography, phenomenology, heuristics, ethnomethodology, symbolic interactionism, ecological psychology, systems theory, chaos theory, hermeneutics and orientational qualitative inquiry (Patton, 1990 p. 88). To understand these epistemological perspectives, Patton (1990 p. 88) has developed an associated central question, reflected in table 2 below.

Table 2: Epistemological Perspectives and Associated Central Questions

Perspective	Central Question
1. Ethnography	What is the culture of this group of people?
2. Phenomenology	What is the structure and essence of the experience of this phenomenon for these people?
3. Heuristics	What is my experience of this phenomenon and the essential experience of others who also experience this phenomenon intensely?
4. Ethnomethodology	How do people make sense of everyday activities to behave in socially acceptable ways?
5. Symbolic Interactionism	What common set of understandings have emerged to give meaning to people's interactions?
6. Ecological Psychology	How do individuals accomplish their goals through specific behaviours in specific environments?
7. Systems Theory	How and why does this system function as a whole?
8. Chaos Theory	What is the underlying order, if any, of the disorderly phenomenon?
9. Hermeneutics	What are the conditions under which a human activity took place or a product was produced that makes it possible to interpret its meanings?
10. Orientational Qualitative	How is x ideological perspective manifesting itself in this phenomenon?

Source: Patton, 1990 p.88.

These epistemological perspectives and associated central questions can lead the researcher to make several assumptions which determine the type of knowledge created by the research study.

While it is fundamental to understand these various research paradigms and perspectives, it is not crucial to *"swear vows of allegiance to any [one] epistemological perspective"* (Patton, 1990, p. 89).

The essential predominant principle that controls the research method selection during this research study is the *"fitness for the research task at hand"* (Atkins, 1984, p. 251). According to Patton (1990, p. 39), the problem should not be *"whether one has uniformly adhered to prescribed cannons of either logical-positivism or phenomenology but whether one has made sensible methods decisions given the purpose of the inquiry, the questions being investigated, and the resources available"*. Thus, a researcher must understand the various research designs and research approaches to make logical methodological choices. Two opposite epistemological positions are known as positivism and interpretivism. Within the boundaries of this spectrum, numerous other epistemological positions exist.

A positivist approach is defined as an *"epistemological position that advocates the application of methods of the natural sciences to the study of social reality and beyond"* (Bryman and Bell, 2011 p.15). Quantitative research is the dominant approach in the positivist position. Thus, while qualitative research can be associated with a positivist research philosophy (Denzin and Lincoln, 2008), it is criticised by scholars as it is argued that the social phenomena associated with business and management are too complicated to establish and develop theories that are guided by definite laws, as compared to scientific studies (Saunders et al., 2012). The literature stresses the intricacy of the social world while making distinctions from the world of natural sciences. To fully

comprehend this complexity, a more compassionate and intuitive philosophy is necessary due to the individuality of people.

Qualitative research is mainly related to an interpretive research philosophy (Denzin and Lincoln, 2011). This is the case as researchers attempt to make logical sense regarding the subjective and socially constructed meanings surrounding the issues under investigation (Saunders, 2012). This type of research is frequently known as a naturalistic research philosophy due to the requirements of a natural setting to gain the trust of the research participants and develop a thorough understanding of the topic being studied. Prasad and Prasad (2002 p. 4) claim *"interpretive inquiry has steadily affirmed its relevance to management and organisation studies by addressing questions that cannot adequately be answered by traditional experimental or survey methodologies and by enhancing our understanding of, among other things, the symbolic dimensions organisational life"*. To fully comprehend the complexity of the social world as distinct from the world of natural sciences, a more intuitive philosophy is necessary for this research since this study aims to explore if and how LMT SMEs innovate for survival and growth. Thus, the research study is informed by an interpretive perspective.

3.4 Research Approach - adopting a deductive approach

The research approach provides various means of answering research questions by outlining different starting and conclusion points; various steps between these points; use of concepts, theories, and styles of explanation or comprehension (Blaikie and Priest, 2019). Deduction, induction, and abduction are the three central approaches applied by researchers in business and management studies. This research follows a deductive approach that *"involves the development*

of a theory that is then subjected to a rigorous test through a series of propositions" (Saunders et al., 2012, p. 117). Blaikie and Priest (2019) outline the progression of the deductive research approach in six consecutive steps below:

1. A hypothesis, idea, or premise is presented in an attempt to develop a theory.
2. Using current literature, concluded by reasoning, a verifiable proposition or number of propositions.
3. Examine the hypothesis and the rationale of the argument, compare and critique this hypothesis with current theories to analyse if it provides a deeper level of comprehension.
4. Assess the hypothesis by gathering the relevant data to measure the concepts and examine it.
5. If the findings are not similar to the hypothesis, the theory is not supported and is considered to be false and must be rejected, altered, and the procedure must be reestablished.
6. If the findings are consistent with the hypothesis, the theory is supported.

An inductive approach leads to theory derived from a study by depicting widespread conclusions based on observations. The objective of this research approach is to explain social features and traits, the nature of regularities, or networks of regularities in social life. Inductive strategies are typically implemented by researchers who aim to answer *'what'* questions, yet are constrained for dealing with *'why'* questions.

Lastly, abduction is a research approach that alternates between deduction (theory to data) to induction (data to theory) and vice versa, thus, linking deduction and induction (Suddaby, 2006).

"Abduction begins with the observation of a 'surprising fact'; it then works out a plausible theory of how this could have occurred" (Saunders, 2012 p. 147). This approach attempts to overcome the constraints of both deductive and inductive approaches and to coordinate with a pragmatist perspective (Bryman and Bell, 2015).

3.5 Research Methodological Choices - adopting a qualitative method

The methodological research choices are shaped by the research question and the phenomena at hand. A qualitative research design was deemed more suitable over a quantitative design in consideration of the research topic and objective of this thesis. The suitability of a qualitative research design is derived from the nature of the phenomenon being explored by the researcher and is chosen as it provides a comprehensive understanding of the interviewee's perceptions and seeks insights into something not yet entirely understood rather than statistical or numerical perceptions derived from quantitative research (Bell, 2014), as is the case in the current study. Additionally, since *"qualitative researchers strive for 'understanding' that deep structure of knowledge that comes from visiting personally with informants"* (Creswell, 1998 p. 193), the study required gaining access to expert individuals under investigation.

3.6 Research Strategy - adopting a case study strategy

The research strategy is the rationale that creates the connection between the data collected, the research conclusions and the research questions (Yin, 2017). The purpose of this section is to present the various research strategies available to the researcher and outline the logic for choosing a case study approach for this research study.

3.6.1 Ethnography

Ethnography is the earliest tradition of qualitative research strategy and is the primary method of anthropology (Patton, 2002). The fundamental question of ethnographic research strategies is *"what is the culture of this group of people?"* (Patton, 1990 p. 88). Therefore, ethnography is a qualitative research strategy that illustrates, clarifies and details the cultural accounts, shared beliefs, behaviours, interactions and languages that shape their paradigm (Cunliffe, 2010). This research strategy was deemed unsuitable for this research study for one significant reason. Ethnographic strategies involve the researcher immersing themselves into the participant's paradigm to rigorously examine, observe and detail over an extended period. The rationale for not choosing an ethnographic strategy was made on the basis that prolonged access to the individuals and the firms selected in the research study would have been difficult to secure and would most likely not have been granted.

3.6.2 Case Studies

"A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 1994, p. 13). Case studies are typically formed by qualitative and not quantitative data as according to Westgren and Zering (1998), it is more suitable when answering *'how'* questions as it provides the opportunity to explore more precisely the behaviour and interactions of the organisation's individuals. Additionally, case studies illustrate an accurate, yet summarized series of events, the prominent individuals involved, and usually have *'an institutional focus'* (Rosselle, 1996). The fundamental characteristics associated with case study research strategies is that context is always considered, leading to a more in-depth understanding of the dynamics that

exist within a single setting. Focusing particularly on context-independent knowledge hinders the learning development, limiting researchers understanding of the phenomenon (Flyvbjerg, 2006 p.221-224). Therefore, it is essential to understand the context of the specific phenomenon itself, as context-independent knowledge can lead to oversimplified interpretations of the phenomena.

Maylor and Blackmon (2005 p. 242) consider case studies to be one of the most valuable research strategies as it allows the researcher to establish proximity with real-world organisations. The predominant aspect of case studies is to gather data, nevertheless, the primary output is in developing and validating theories (Eisenhardt 1989; Yin, 1994; Westbrook, 1995; Swartz and Boaden, 1997). According to Yin (2009, p. 15), case study research is most suitable when the objective is to *"expand and generalise theories (analytic generalisation) and not to enumerate frequencies (statistical generalisation)"*. Case studies are often believed to make significant contributions to the knowledge and comprehension of the social, political and economic phenomenon while accomplishing the need to understand complicated and intricate entities (Patton, 2002). When case studies are carried out correctly, they are responsible for capturing holistic and meaningful aspects of industry practice (Yin, 2017).

A case study strategy is considered the most suitable research method for this study given *"case studies are the preferred research strategy when 'how' or 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context"* (Yin, 1994 p.1). Since the study at hand poses *'how'* questions, the research approach most appropriate would, therefore, seem to be a case study strategy as it matches the requirements as outlined by Yin (1994).

Table 3: Requirements for the Case Study as a Preferred Research Strategy

Requirements for the Case Study as a Preferred Research Strategy	Corresponding Characteristics of this Study
1. Must be a *'how'* or *'why'* question.	This study asks the question, *"how LMT SMEs innovate for survival and growth?"*
2. Investigators must have little control over events.	Control over events would be essentially impossible as no control could be gained over the macro-environment that affect LMT SMEs in the food sector.
3. Must be a contemporary phenomenon.	This research is considered a contemporary phenomenon as the neglect of LMT SMEs over larger HT organisations has prompted scholars to call for increased attention to this classification (Robertson et al, 2009; Hirsch-Kreinsen, 2015; Weidner and Som, 2015; Trott and Simms, 2017; Hullova et al., 2019).
4. Must occur in a real-life context.	It is considered that LMT SMEs, with little to no investment in R&D, often have long life cycles, indicating the capability to innovate without R&D.

Source: (Yin, 1994).

The requirements for case studies as a preferred research strategy can also be seen in the following figure 5. This figure outlines the portfolio of case study research designs and the differences between each of the research designs.

Figure 5: Portfolio of case study research design: differences in underlying elements.

	Case study research designs			
	No theory first	Gaps and holes	Social construction of reality	Anomalies
Representative scholars	Eisenhardt	Yin	Stake	Burawoy
The case	Research question; A priori constructs, variables; No assumed relationships	Research question; Existing theory; Proposition; Framework	Curiosity in the case; Understanding of research issues	Curiosity; Existing theory; Anomalies; Internal contradictions; Gaps, silences
The data	Theoretical sampling; Qualitative data as the primary choice	Purposeful sampling; Qualitative data as the primary choice	Purposive sampling; Thick descriptions; Holistic comprehension	Theoretical sampling; Dialogue of observer and participants; Participant observation
The analysis	Emerging constructs and relationships	Pattern-matching as a primary choice; Analytic generalization	Learning from the case; Categorical aggregation	Social processes; Structuration; Reconstruction of theory

Source: Ridder, 2017.

The case study research design most suitable for this study was developed by Yin (2014). According to Yin's (2014) research design, an existing theory is used to advance theoretical explanations where there is existing *'gaps and holes'* in current theory, as is the case in this study. Thus, research questions are designed to gain an understanding of a partially understood phenomenon that has been distilled from a review of the relevant literature. In addition to the review of existing theory and the development of research questions, propositions and frameworks

which come from existing theory provide direction for the study and guide the researcher in their attempts to fulfil their research objective. Further, the *'gaps and holes'* case study research design followed in this thesis applies a purposeful sampling procedure while qualitative data is the primary choice for data collection. The primary choice of data analysis when applying Yin's research design is pattern matching as a method of comparing theory-based propositions with the data collected, supported by analytical generalisation, therefore enhancing the value of the theory.

The single case versus multiple cases

Single case studies are typically used when researching a specific, singular or extreme case. They are commonly chosen as a suitable research strategy as it allows for the critical analysis of a phenomenon not yet fully understood (Saunders et al., 2012). Single case studies are typically implemented by part-time students for the specific industry or company where they work (Saunders et al., 2012). Case study research strategies can also include multiple cases. The logic for implementing this method is based on the prediction that multiple case studies will lead to similar results (Saunders et al., 2012), which is referred to as *'literal replication and theoretical replication'* (Yin, 2009 p. 59). Miles et al. (2014, p. 30) suggest that *"multiple cases offer the researcher an even deeper understanding of the processes and outcomes of cases, the chance to test (not just develop) hypothesis, and a good picture of locally grounded causation"*. Thus, multiple case studies were chosen as part of this research.

After reviewing the relevant literature associated with case study research, several limitations and criticisms are evident. These include the lack of accurate, exhaustive and unbiased theory development where a specific purpose or agenda may be the objective, therefore removing

meaningful and important data (Amaratunga and Baldry, 2001; Seuring, 2008). Secondly, *'researcher bias'* and the absence of objectivity are considered the core criticisms of a case study strategy (Bromley, 1986; Becker, 2008). Thirdly, some scholars believe that case studies are limited as they are slow and delay the research since the procedures followed to complete the process take too much time (Westbrook, 1995; Swartz and Boaden, 1997). Lastly, there is often too much descriptive information with limited analytics to examine the case study (Westbrook, 1995; Simon et al, 1996). However, regardless of these limitations, case study research remains the most suitable research strategy. Thus, the following steps outlined below were all taken to reduce and diminish the limitations of case study research:

1. To refrain from collecting partial, bias, and prejudice data, multiple case studies were selected rather than single case studies.
2. The generalisations derived from case studies are in an analytical form rather than statistical.
3. An analytical approach is implemented rather than a descriptive approach.
4. To ensure common variables between the case studies were selected, specific criteria were outlined that companies must fit to be selected for the research study.
5. The data collected was analysed across prior information sources such as secondary desk research to ensure accuracy through triangulation.

3.7 Research Nature

3.7.1 Exploratory Case Study

Once the decision that a case study strategy was most suitable, different types of case studies were then analysed. Six distinct case study types are identified and outlined below.

Table 4: Case Study Type

Case Study Type	Description
1. Illustrative	This case study is descriptive and intended to add realism and in-depth examples to other information about a program or policy.
2. Exploratory	This is also a descriptive case study but is aimed at generating hypotheses for later investigation rather than illustrating.
3. Critical instance	This examines a single instance of unique interest or serves as a critical test of an assertion about a program, problem, or strategy.
4. Program implementation	This case study investigates operations, often at several sites, and often normatively.
5. Program effects	This application uses the case study to examine causality and usually involves multisite, multimethod assessments.
6. Cumulative	This brings together findings from many case studies to answer an evaluation question, whether descriptive, normative, or cause-and-effect.

Source: (GAO, 1990 p.9-10)

Exploratory case studies are considered the most appropriate research strategy for investigations in new research areas (Gartner and Birley, 2002). Thus, it is considered the best fit for the research task at hand since it is a means to ask open-ended questions to gain greater insights and probe for deeper levels of understanding into the topic under investigation. Exploratory research is conducted in a variety of ways such as conducting a literature review; or interviewing professionals and industry experts. The exploratory nature of these interviews means that many of the interviews

were semi-structured and depend heavily on the quality of the information provided by the interview participants to assist the consecutive research phases. Exploratory research, therefore, begins with a broad perspective and becomes more narrow as the research project develops.

Yin's (1994) specific criteria used for developing exploratory case studies were implemented during the initial phases of this research study. Yin (1994, p29), states that *"an exploratory study should be preceded by statements about (a) what is to be explored, (b) the purpose of the exploration, and (c) the criteria by which the exploration will be judged successful"*. Thus, rationale and justification for the actions taken at the beginning of the research project must be established, regardless if these logical justifications are later proven to be inaccurate. It is suggested that while the early establishment and clarification of a research question is vital to an exploratory case study, it is just as crucial to realising that this can be changed and amended throughout the progression of the research study (Eisenhardt, 1989 p.536).

Literature Review Before Entering the Field

Some researchers prefer to enter the field without carrying out a literature review to refrain from a biased perspective incorporated in the findings and conclusions of existing literature (Maylor and Blackmon, 2005). This approach is considered by some to be *"… more typical of student projects and dissertations, where time constraints and other practical considerations…are important"* (ibid, p 146). However, Yin (1994) claims that the development and review of relevant literature before the collection of case study data is superior to entering the field without conducting a literature review. Thus, a preliminary literature review was conducted before entering

the field. Once the literature review was completed, information was frequently added to the review repeatedly until the final phases of the research study.

3.8 Propositions

The case study research design applied in this study was developed by Yin (2014). *'Gaps and holes'* in current theory have been distilled from a review of the relevant literature to advance theoretical explanations that are partially understood. In the case of this study, the theory contributing to SME survival and growth is subject to test through the following series of propositions. As discussed in the literature, the first-order propositions contributing to SME survival and growth is as follows:

1. Collaboration supports LMT SME innovation capability.
2. Entrepreneurial orientation supports LMT SME innovation capability.
3. Marketing ability supports LMT SME innovation capability.
4. Learning capacity supports LMT SME innovation capability.

The second-order within the discussion of each of these four elements supporting innovation capability, as deducted from the literature, is to examine:

1. Innovation supporting capabilities are firm centric (internally controlled) to LMT SMEs.
2. Innovation supporting capabilities are external (ERBV) to LMT SMEs.

3.9 Sample Selection – Purposeful Sampling

The case study companies selected in this study were chosen through purposeful sampling and were drawn from the food sector LMT SMEs in the Munster region. The list of potential companies

was built using various publicly available databases from different sources including Enterprise Ireland, Bord Bia, Supervalu Food Academy Directory, Tesco Taste Bud Directory, Irish Times Top 1000, Good Food Ireland, and other articles from the Irish Times and Irish Examiner. After an analysis of these databases of SME firms, a list of one hundred food sector companies was developed. This was followed by the development of a more refined list of ten companies, reflective of the category criteria necessary to consider a SME a potential case study. Failure to meet any of the following requirements eliminated any potential company from participating in the study. The selection criteria for this study includes participants who represent firms that:

1. Employ between 20 – 160 staff members.
2. Have headquarters established in the Munster Region (due to geographical limitations.)
3. Have a total revenue of between €5,000,000 - €20,000,000 per annum.
4. Have been established for greater than 5 years, and less than 100 years.
5. Operate in both National and International Markets.
6. Manufacture or package their products on their premises.

The ten target companies selected were reviewed by the supervisory team and confirmed before contacting the same. All ten companies were invited to participate in the research study. Seven of the companies accepted the invitation to participate while three companies couldn't commit. Within these seven case companies, the target interviewees were the general manager/owner, and at least one member of the upper-level management team, nominated by the general manager/owner. Selection of this cohort of individuals was necessary since such individuals possess a holistic perspective of how innovation within the firm is achieved. Undertaking multiple

individual interviews within each case allowed for the triangulation of the information received to ensure the reliability of the research and to counteract individual bias.

To gain access to the expert individuals under investigation, potential interview participants were written to by letter outlining the nature of the research, its potential value for the regional economy and a request for their participation in the interview. The letter included details surrounding the nature of the research, the requirements, the implications of taking part, participants rights, how their data will be analysed, reported, stored and who to contact in case of any concerns. Following this letter, and within a week, a call was made to each potential interview candidate. Respondents were reassured of the confidentiality of all data and all information specific to any organisation. Once companies agreed to participate in the interview, they were once again, informed and assured of the confidential nature of the interview and that they had the right to withdraw from the process and not have their input included in the research at any stage of the interview. The voluntary participation in the interview was made explicitly clear to each participant. The information required by potential participants to reach a fully informed decision about whether or not to participate was produced formally in written form.

If they agreed to participate, an information sheet informing the participants of the nature of the research was sent by email. This document included details regarding the requirements and implications of taking part, participant's rights, how their data will be reported, how data will be stored and who to contact in case of concerns. Informed consent was obtained using consent forms before the interview process from those who agreed to participate in the research study voluntarily after the purpose and nature of the research were explained in writing as per the research

information sheet. Before the interview commenced, both the researcher and the participants signed the consent form. The use of written consent forms helps to clarify the boundaries of consent as the research involves the collection of confidential, personal and company data. It was made clear that anonymity will be ensured in the research output through disguised extracts from the interviews. This consent form also included a request for permission to record the interview and indicated that they can withdraw from the study, without repercussions, at any time, whether before the interview started or while participating and up until two weeks after the interview took place, in keeping with best practice.

After the interview was conducted, interview transcripts were disguised using pseudonyms. The interview participants were sent their interview transcript in a secure, password-protected file. They had the opportunity to review the transcript to ensure accuracy and make any amendments they deemed relevant. An email reply was sufficient to ensure the interview participants were satisfied with the data collected, provided the participant made no amendments. Any amendments were made over the phone between the researcher and the interview participant.

3.10 Case Profiles

The selection criteria for this study consists of firms that satisfy the following criteria: firms that employ between 10 – 249 employees, have headquarters established in the Munster region, have a total revenue of between €5,000,000 and €40,000,000 per annum, have been established for greater than 5 years, sell products in both national and international markets, and manufacture or package their goods on their premises since food firms that outsource product manufacturing engage in divergent innovation activities. Thus, not all companies included in this study are

homogenous as nuances in firm characteristics exist. Respondent profiles have been drawn up in table 5 providing an overview of the seven case studies included in this study.

Table 5: Firm Criteria.

Criteria	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Size (Employees)	50 - 100	50 - 100	10 - 49	10 - 49	10 - 49	50 - 100	100 - 160
No. of Years Established	10 - 25	> 25	> 25	10 - 25	> 25	10 - 25	< 10
Revenue (Millions)	€5 - €10	€10 - €20	€5 - €10	€10 - €20	€10 - €20	€5 - €10	€20 - €40
Product Portfolio	15-30	< 15	< 15	< 15	< 15	> 30	> 30
Export Markets	European	Global	International	Global	European	Domestic	International
Product Groups	Dairy	Meat	Preserves	Beverage	Preserves	Preserves	Seafood
Type of Customer	Retail and Food Service	Retail	Retail and Food Service	Retail	Retail	Retail, Food Service, Industrial and Butchery	Retail
Manufacturing Region	Munster Region	Munster Region	Munster Region	Munster Region	Munster Region	Munster Region	Munster Region
Data Source - Interview 1	Managing Director	Managing Director	Managing Director	Managing Director	Managing Director	Managing Director	Managing Director
Data Source - Interview 2	NPD Manager	Sales Manager	Commercial Manager	Business Development Manager	Supply Chain Manager	Business Development Manager	R&D and Innovation Manager
Data Source - Secondary Data	12 Sources	8 Sources	12 Sources	14 Sources	8 Sources	3 Sources	8 Sources

Reflecting on table 5, three of seven firms have fewer than forty-nine employees, three have between fifty and one hundred, while the one remaining firm *(Firm G)* has one hundred and sixty employees. Thus, *Firm G* is an exception due to its rapid growth in revenue since it was established in 2010, going from two million in revenue to over forty million in just nine years. Firm F is also the youngest firm included in this study. The average age of the case companies is twenty-three

years indicating that the majority of the cases are well established. Three of the seven firms have been established for between ten and twenty-five years, while the remaining three are between twenty-five and thirty-eight years in existence. The longevity of these case companies indicates a level of embeddedness in their region, further exemplified by interview statements.

The total annual turnover for three of the seven cases is between €5,000,000 and €10,000,000, while three of the other seven cases had an annual turnover between €10,000,000 and €20,000,000. Only one of seven cases *(Firm G)* had revenue of €40,000,000, which can be explained by the rapid growth experienced, predominantly achieved in export markets. *Firm F* is the only one of the seven cases to solely supply the domestic Irish market. However, while this is the case, they do supply four different customer types within the Irish food sector (e.g. retailers, food service, butchery, and industrial customers). Each of the other case companies supplies only retailers and foodservice meaning *Firm F* uses more resources targeting these additional customers within their domestic market, preventing them from targeting international markets. Two of the seven cases export to European countries, a further two cases export to the wider European market while the remaining two case companies export on a global level. When it comes to the product group categories, three of the firms produce preserves while the remaining four firms sell products into the following departments: seafood, meat, dairy and beverage.

3.11 Data Collection Techniques

The variety of data collection techniques that exist are virtually endless. Based on a qualitative perspective, researchers use data collection methods such as semi-structured or open interviews, visual data (photos or film analysis), group discussions (focus groups, group discussions, joint

narratives, or group interviews), forms of written documents (articles), and websites as a source of information (Denzin and Lincoln, 2000; Flick, 2018; Arksey and Knight, 1999; Maylor and Blackmon, 2005). This list of data collection methods has not been formed as an exhaustive list; instead, it is intended to bring attention to the volume of choices available in business research when choosing an appropriate method. The methods used in this research study include both primary (semi-structured interviews) and secondary research methods. Maylor and Blackmon (2005, p. 172) differentiate between primary and secondary data collection methods as *"...primary data are data you have collected yourself specifically for your project and secondary data are data other people have collected for their own research projects or commercial proposes"*.

3.11.1 Primary Data - Semi-Structured Interviews

The primary data collection method applied in this study includes the use of semi-structured interviews, in an attempt to ask key participants about objective facts and to obtain the participant's opinions about relevant events (Yin, 1994, p. 84). The primary data sources included interview audio recordings, interview transcripts, and the researcher's notes. Thus, the research data collected in this study is of a qualitative and exploratory nature. Expert individuals were selected for in-depth, semi-structured interviews. Since seven case study companies agreed to participate in this study, interviews were conducted with each of the seven company directors, and one member of their upper-level management teams. Thus, fourteen interviews were conducted throughout this investigation. These individuals were selected since these interviewees strategic beliefs and interpretations of reality form the firm's innovation practices and strategic trajectory (Green, 1992). Therefore, the interview participants' views and interpretations play an important role in this approach. Participants wished to tell their company's story in their way. Consequently,

flexibility is required, something facilitated by the semi-structured nature of the interview protocol. However, it must be considered that some structure is equally important and thus the interview protocol ensured the discussion stays on track.

The decision to refrain from using an unstructured interview technique was made as, in reality, many *"respondents lead hectic, deeply segmented, and privacy centred lives. Even the most willing of them have only limited time and attention to give the investigator"* (McCracken, 1988 p. 10). The interviews with the research study participants took place while the interviewees were at work or during work hours, meaning it was highly unlikely that participants would be willing or even granted permission (in the case of upper-level management) to allocate the number of hours it would take to implement an unstructured interview technique. Semi-structured interviews provide an effective alternative since facilitating a conversational style offers deep insights that are non-existent in other forms of data collection methods such as questionnaires. To gain the required insight, semi-structured, one-to-one interviews allows the interviewer to probe answers and have each participant explain if and how they innovate for survival and growth and elaborate on their responses.

Semi-structured interviews were guided by an interview protocol that was distilled from a preceding literature review of the innovation management and SME literature. The literature review was performed for developing the theoretical foundation for this thesis. All of the interviews took place face to face between May 2018 and June 2018. The interview protocol provided the structure and framework necessary to guide the flow of the interview. Potential issues outlined in the literature that required the interviewer's attention to appropriately manage the

interview were as follows: impression management, topic avoidance, deliberate distortion, minor misunderstanding, and incomprehension (McCracken, 1988 p. 38). Attention is given to the topic of avoidance as what the participant decides to refrain from discussing during the conversation may be as important as the topics that are stressed (Arksey and Knight, 1999 p .101). Regarding '*deliberate distortion*', it is understood that "*truthful accounts are more coherent, are typically longer than dishonest accounts, and contain verbal hedging"* (Colwell et al. 2002 p .296). Additionally, if the interviewer had a feeling that the interviewee had failed to understand the question then it was repeated and clarified to ensure accuracy. Lastly, right throughout the interview, significant attention was given to ensure the interviewer was: listening carefully, showing empathy where appropriate (Knight, 2002 p. 55), and seeking out data that could falsify existing theory or generate new ideas for exploration (McCracken, 1988). After the interview was completed, each interview participant was shown great appreciation for participating in the interview and were informed of their valuable contribution to the research study (Arksey and Knight, 1999 p. 102).

3.11.2 The Interview Protocol

The interview protocol (see Appendix II) outlines the format that the semi-structured interview will take. The first task required was the design of a suitable protocol to beta test the interview protocol structure and content on *'pilot'* interviewees. The interview protocol developed for this research study was piloted on two company directors of LMT SMEs within the food sector. Based on these pilot interviews, several refinements were implemented to improve the studies reliability as new learnings were realised through practice interviews (Knight, 2002). All interview questions within

the interview protocol were distilled out from the literature review that is presented in chapter two of this thesis.

The interview protocol was divided into seven sections. Each set of questions were designed to facilitate a deeper exploration of this particular dimension and enhance our understanding of how LMT SMEs innovate. Section one begins with the background of the company, therefore, opening with easy-to-answer icebreaker questions (Arksey and Knight, 1999 p. 98). This set of introductory questions provided a more relaxing environment where the informants would likely feel more comfortable while also providing context for the overall interview protocol. Section two investigates the cases competitive advantage to gain an understanding of the firm's competitive landscape and to understand how the cases under investigation differ from their competitors. Section three focuses on innovation and is designed to facilitate a conversation between the interviewer and interviewee regarding the cases companies' different projects and developments. Thus, the interviewee can discuss the project in detail allowing the interviewer gain an understanding of the project and distil from the discussion; if they innovate, how they manage their innovation activity, and what capabilities underpin their ability to innovate. This is followed by section four which further investigates the innovation capabilities of the case companies to address research question three of this thesis. Section five is designed to investigate the level of open innovation and collaboration among the case companies since this capability was evident from the preceding literature review presented in chapter two of this thesis. Section six focuses on the R&D expenditure of the case companies since this is widely regarded as the main measure of innovation. However, since the focus of this thesis is on the LMT SMEs, which by definition are not R&D active, yet are responsible for a wide range of innovations, it is necessary to investigate the level

of R&D expenditure of the case companies. Lastly, section seven of the interview protocol is designed to gain an understanding of the future objectives, strategies (if any), and ambitions of the case companies.

3.11.3 Secondary Data

Secondary data points were collected on the seven case companies by conducting desk research that collected data from publicly available sources, before the semi-structured interviews. This data was collected to help inform the researcher of the intricate details of the interview participants and to give the researcher a more comprehensive understanding of the organisation's position. This secondary data includes documents such as company reports, strategic documents, newspaper articles, patent records, video and audio files. These documents were of utmost importance in the thesis write-up by facilitating a more comprehensive triangulation process to verify the data collected during the company interviews and thereby enhancing the data credibility (Yin, 2017) while also allowing for similarities and differences between cases to emerge. Secondly, in the process of undertaking the interviews, in certain cases, private firm-specific, supporting documentation was given by the interviewee to support the discussion. In such instances, this data was used to triangulate against other data sources e.g. interview transcripts and secondary data.

3.11.4 Method Limitations

The data collection limitations of this study stem from the limitations associated with semi-structured interviews since this was chosen as the main data collection strategy. Semi-structured interviews are constructed in a manner that facilitates the capture of an individual’s perceptions and ideas. However, the answers that are provided in these interviews are not always reflective of

the actions they make in reality (Arksey and Knight, 1999 p. 15). Additionally, given semi-structured interviews lack structure, they ask open-ended questions which bring into consideration the question of whether or not the interviewee provided a comprehensive answer to the question or if they just provided information that initially came to mind, thus potentially failing to collect valuable data (Knight, 2002 p.5).

To combat these limitations, triangulation is used to reduce the limitations of any particular data collection technique. However, even secondary data such as company documents, statistics, and publicly available information may not be impartial (Arksey and Knight, 1999, p.17). These data-gathering limitations are considered by many scholars as a threat to the validity of research outputs. However, they accept these limitations on the basis that implicated data is more valuable than no data (Arksey and Knight, 1999, p.51).

3.12 Data Validity and Reliability

Creswell (1998) advocates for two procedures to be carried out to verify the information collected during a *"qualitative study is believable, accurate and correct?"* (Creswell, 1998, p. 193). The two most significant verification processes are triangulation and member checks. *"Triangulation is the rationale for using multiple sources of evidence"* (Yin, 2009, p. 114). Throughout this investigation, triangulation procedures were implemented, *"for the purpose of corroborating the same fact of phenomenon"* (Yin, 2009, p.116). The main triangulation procedures included are prolonged engagement and persistent observation before the case and interviewee selection, the design and peer review of an interview protocol, triangulation through multiple in-depth interviews, and coding using NVivo which was supported by a peer review coding process.

Additionally, member checks were used as the researcher sent the interview participant a copy of the interview transcript to make any amendments or to confirm their satisfaction with the accuracy of the interview transcript. Further, according to Yin (2009, p. 45), the *"goal of reliability is to minimize the errors and biases in a study"*. Thus, the following procedures were taken to achieve a reliable research study:

- Interview professionalism (Flick, 2018), supported by an interview protocol and audio recording;
- Detailed field notes and transcript data (Creswell and Poth, 2017);
- Comprehensive and meaningful codebook produced (Creswell and Poth, 2017) using Nvivo, see Figure 6;
- The case study protocol (Yin, 2009), see Appendix II;
- Case study database (Yin, 2009).

3.13 Data Analysis

The analysis of data is described as *"the heart of building theory for case studies, but it is the most difficult and least codified part of the process"* (Eisenhardt. 1989 p. 539). Pattern-matching is used to compare the theory-based propositions with the data collected. According to Yin (2014 p. 143), "*For case study analysis, one of the most preferred techniques is to use a pattern-matching logic. Such a logic (…) compares an empirically based pattern–that is, one based on the findings from your case study–with a predicted one made before you collected your data (….)"*. Data analysis using a systematic process is supported by Spiggle (1994 p. 496), *"not to straitjacket the analysis, but to stimulate a complete analysis, uncovering all possible leads. Systemic processes minimize potential distortion from selective use of the data"*.

To facilitate this data analysis involving pattern matching and analytical generalisation, a data coding process was implemented. *"A code in qualitative inquiry is most often a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data"* (Saldana, 2015 p. 3). The data coding process is the first step of the data condensation procedure followed in this research study. This analysis primarily concentrated on interviews, and private secondary data collected through the interview process. The participant's interviews were transcribed promptly after the interviews were conducted, and frequently read to ensure the researcher intimately understood the transcript content. The transcripts were continuously coded and re-coded as the research study advanced.

The coding process was split into two distinct phases (Saldana, 2015); descriptive coding and pattern matching coding. The first coding phase conducted is referred to as *'descriptive coding'* (Wolcott, 1994), also referred to as thematic coding. This style of coding can be described as a process that summarises the basic message of a sentence or section of qualitative data collected as part of the data collection process into a word or short phrase. Tesch (1990 p. 119) ensures to clarify that *"it is important that these [codes] are identifications of the topic, not abbreviations of the content. The topic is what is talked or written about. The content is the substance of the message"*. The second phase of the coding process as outlined in the literature is referred to as *'pattern coding'* (Saldana, 2015). *"Pattern codes are explanatory or inferential codes, ones that identify an emergent theme, configuration or explanation. They pull together a lot of material from first cycle coding into more meaningful and parsimonious units of analysis"* (Miles, 2014 p. 86).

The data analysed, including both primary and secondary data, as part of this thesis were done so through the process outlined in table 6 by Miles and Huberman (1994 p.9).

Table 6: Classic Set of Analytic Moves

Steps	Analytic Moves
1.	Codes were affixed to interviews or observations.
2.	Reflections on transcripts were noted.
3.	Similar phrases, relationships between variables, patterns, themes, and distinct differences between subgroups, and common sequences were looked for.
4.	These ideas were kept in mind during the next wave of data collection.
5.	A small set of analytical generalisations were gradually elaborated on.
6.	These analytical generalisations were confronted with a formal body of knowledge in the form of constructs and theories.

Source: Miles and Huberman, 1994 p.9.

Additionally, three archetypical sources of analytical bias, as outlined in table 7 were consistently addressed throughout the coding process in an attempt to reduce analytical bias.

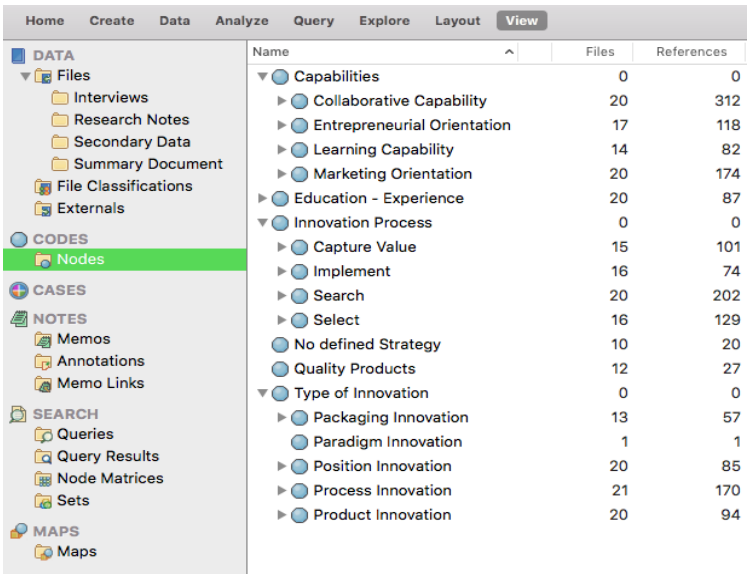
Table 7: Archetypal Sources of Analytic Bias

Archetypal Sources of Analytic Bias	Description
1. The Holistic Fallacy	Interpreting events as more patterned and congruent than they are, looping off the many loose ends of which social life is made.
2. Elite Bias	Overweighting data from articulate, well informed, usually high-status informants and under-representing data from less articulate, lower-status ones.
3. Going Native:	Losing your perspective or your bracketing ability, being co-opted into the perceptions and explanations of local informants.

Source: Miles and Huberman, 1994 p. 262.

A peer-review process was adopted for this research study. This was considered a vital strategy in restricting the partial analysis of the collected data. Further, NVivo was used to organise, store and accurately code the study's findings. NVivo was necessary since the coding process was required for a total of 400 pages across fourteen transcripts.

Figure 6: NVivo - First Level Coding.



However, regardless of the preventative measures adopted throughout this research study, all research strategies and decisions taken as part of this thesis will have their limitations due to the reality that *'perfect knowledge'* does not exist.

For a systematic representation of the methodological choices made during this study, see table 8.

Table 8: Synopsis of Methodological Choice

	Synopsis of Methodological Choices
1.	A literature review was conducted to develop the theoretical foundation for this thesis, before entering the field.
2.	An exploratory approach was chosen due to the lack of prior research in this area (Eisenhardt, 1989; Yin, 2003).
3.	The case study research was chosen as it is the most suitable when answering *'how'* questions (Westgren and Zering, 1998), as is the case in this study.
4.	This research adopted a qualitative approach.
5.	A semi-structured interview protocol was developed from the preceding literature review of innovation management and SME literature.
6.	Ten food sector LMT SMEs in the Munster region were written to by letter to request their participation in the interview. Seven of the ten companies agreed to participate.
7.	Publically available secondary data on the seven cases such as newspaper articles, video and audio files were collected through desk research.
8.	In total, fourteen semi-structured interviews were conducted with seven cases including the managing director and one member of the management team of each firm since such individuals possess a holistic perspective of how innovation within the firm is achieved. Additionally, private secondary data, such as company reports and strategic documents were collected from some interview participants as part of the interview process.
9.	All fourteen interviews were transcribed amounting to a total of 400 pages.
10.	All transcripts and secondary data were uploaded to NVivo which lead to the development of first level codes, second-level codes, and recording of power quotes. This was reviewed by supervisors.
11.	Interview participants were sent their interview transcript in a secure, password-protected file to review the transcript and make any necessary corrections to ensure accuracy.
12.	The audio files and digital interview transcripts were stored securely and separately on two NAS files on a secure server on University College Cork premises. - NAS File (1) contains the digital transcripts of the interviews - NAS file (2) contains the audio recordings from the interviews. Dr Lawrence Dooley has stored all physical documents securely and separately in a locked filing cabinet, in his locked office on UCC premises.

- (1) contains hard copy files including anonymised, publically available secondary data and consent forms.
- (2) contains secondary private company documents collected as part of the interview process.

13. In line with research integrity best practice, the data will be securely held for a minimum of ten years after the completion of the research project. Following this period, the data will be destroyed, paper documents will be shredded, and computer files and other digital material will be permanently deleted.

3.14 Concluding Remarks

This brings the methodological discussion to a close. To summarise, this research follows a rigorous test of existing theory through a series of propositions. In consideration of the research topic and the objective of this thesis, a qualitative research design was deemed most suitable to provide an understanding of the interviewee's perceptions and to seek insights into something not yet entirely understood, as is the case in this thesis. The *'gaps and holes'* case study approach developed by Yin was applied since the primary research objective is to gather data that develops, expands and support theories (Eisenhardt 1989; Yin, 2009). Thus, three research questions were developed, derived from existing theory, in an attempt to answer the overall research objective. These research questions were supported by the use of propositions and existing theoretical frameworks. In line with the *'gaps and holes'* research design, a purposeful sampling technique was applied since these individual's strategic beliefs and interpretations of reality form the firm's innovation practices and strategic trajectory (Green, 1992). The data collection techniques applied included primary and secondary data sources. Primary data sources involved conducting fourteen semi-structured interviews across seven case studies, each guided by an interview protocol. Additionally, in some cases, interviewees supplied private company documents such as strategic company reports to support the discussion and provide additional information to the interviewer.

Secondary data sources included publically available data sourced from newspapers, websites, and video files. Multiple firm interviews, private company documents, and publicly available documents were essential in the triangulation process to verify the data collected and enhance the data credibility (Yin, 2017). Additionally, all interviewees were sent the interview transcripts and allowed to make any amendments to the data. Further, all data collected was reviewed by the supervisory team. Lastly, pattern matching was used in the data analysis phase as a method of comparing theory-based propositions with the data collected. This was supported by analytical generalisation which attempts to enhance the value of the theory. For a graphical representation of the findings and discussion section overview, see table 9 below.

Table 9: Findings\Discussion overview.

Research Question	Model \ Proposition applied to test question	Findings Section	Discussion Section
RQ1	Tidd and Bessant's 4 P's of Innovation space	Section 4.3	Section 5.2
RQ2	Tidd and Bessant's Innovation Process model	Section 4.4	Section 5.3
RQ3	P1: Collaboration supports LMT SME innovation capability.	Section 4.5.1	Section 5.4.1
	P2: Entrepreneurial orientation supports LMT SME innovation capability.	Section 4.5.2	Section 5.4.2
	P3: Marketing ability supports LMT SME innovation capability.	Section 4.5.3	Section 5.4.3
	P4: Learning capacity supports LMT SME innovation capability.	Section 4.5.4	Section 5.4.4

4 CHAPTER FOUR - FINDINGS

4.1 Introduction

This chapter presents an analysis of the primary (interview transcripts and private company documents) and secondary data (publicly available documents) collected in the fieldwork stage of this research, as outlined in the methodological section. To address the overall research question that aims to explore if and how LMT SMEs innovate for survival and growth, the research seeks to explore three related questions, as previously outlined. This chapter begins by outlining LMT SME characteristics identified in this study such as the centrality of the entrepreneur, the dependency on a few key employees, strong relationships with firm stakeholders, resource constraints, and a risk-averse attitude. Further, the LMT SME case study companies are separated into typologies including *high growth* vs *low growth* firms and *family* vs *non-family* firms. The purpose of these typologies is to provide structure and deepen the analysis by classifying case study companies based on similar attributes.

4.2 Typologies

The first typology distinguished *high-growth* and *low-growth* firms. Companies that satisfied a minimum of four of the following criteria were considered *'high growth',* while those who did not were considered *'low growth'*. In this study, firms are considered *high growth* provided they have, in the last five years, increased employment by 50% or greater, focused on wider European and Global markets, increased revenue by 50% or greater, launched five or more new products, and

lastly the owner displays an ambition to grow. Thus, *Firm B, D, and G* are all considered *'high growth'* firms while *Firm A, C, E, and F* are all considered *'low growth'*. Table 10 reflects these criteria.

Table 10: High Growth Vs Low Growth Typology

Firm	Summary	Age	Employees	% ↟ Employees	Market Focus	% ↟ Turnover	NPD - 12 months	Growth Ambition
Firm A	Low Growth	22	50	50 - 100 %	Domestic/ UK	50 - 100 %	3 - 5 Products	Yes
Firm C	Low Growth	28	28	< 50 %	Wider European	< 50 %	1 - 3 Products	No
Firm E	Low Growth	35	40	> 100 %	Domestic	< 50 %	1 - 3 Products	No
Firm F	Low Growth	18	50	< 50 %	Domestic	50 - 100 %	> 5 Products	Yes
Firm B	High Growth	38	48	50 - 100 %	Global	50 - 100 %	0 Products	Yes
Firm D	High Growth	15	42	> 100 %	Global	> 100 %	> 5 Products	Yes
Firm G	High Growth	9	160	> 100 %	Wider European	> 100 %	> 5 Products	Yes

Table 10 highlights how all seven case companies are growing. There is a shared philosophy among the case companies that they must continue to grow. According to *Firm C: Manager*, a *'low growth'* firm:

> *"in retail, you can't stay flat. You either grow or you die and that's pretty much it."*

Interestingly, each firm's perceptions of their growth trajectory were aligned to how they have been categorised for this study, with the exception being *Firm F*. According to *Firm F:*

> *"Growth would probably be one of the big success stories... going from a very small company to a medium-sized company now in a very short space of time."*

However, in the context of *Firm F*, this is categorised as *'low growth'* since within the last five years, they haven't increased their revenue by greater than five million or launched their products in any additional export markets. Further, the growth ambitions of *'low growth'* firms are different from those of *'high growth'* firms in this study. According to *Firm C: Director:*

> *"There has [never] been any major changes… change has always been very slow here… never been any massive growth, never any massive investment"*.

Thus, *low growth* firms seek out incremental growth, while *high growth* firms seek out exponential growth. This growth ambition and objective is likely to impact innovation type and novelty, the process by which firms innovate and the capabilities that underpin their innovation activity.

The second typology examines the *family* vs *non-family* characteristics of the firms. A variety of measures were used to indicate the level of family involvement in the organisation (Zahra et al., 2007). The European Commission's definition states that an organisation is considered a family firm provided the family has ownership of a minimum of fifty per cent shares and at least one family member involved in the management of the firm itself (Westhead and Howorth, 2007; European Commission, 2009; Zellweger et al., 2012; Classen et al., 2014). The criteria that *family* and *non-family* firms were categorized is outlined in table 11.

Table 11: Family Vs Non-Family Firm Typology.

Firm Participant	Summary	Generation in control	Director's Relationship	Succession plan
Firm A	Family Firm	1st Generation	Family	No
Firm C	Family Firm	Intergenerational	Family	Yes
Firm E	Family Firm	Intergenerational	Family	Yes
Firm G	Family Firm	Intergenerational	Family	Yes
Firm B	Non-family Firm	1st Generation	N/A	No
Firm D	Non-family Firm	1st Generation	No family relations	No
Firm F	Non-family Firm	1st Generation	No family relations	No

Included in this study are four family firms. Of these four firms, three have transitioned from the first generation to the second generation. The fourth family firm, *Firm A* does not have any succession plan as according to the company director, the next generation are too young to be concerned with succession plans. Additionally, the relationship between the firm directors of these four family firms is either a husband and wife team, parent and child partnership or sibling partnerships.

4.2.1 Cross Case Analysis of Typologies

To understand the '*high growth vs low growth*' and '*family vs non-family*' typologies across all seven cases, we examine five factors such as age, employee number, market served, turnover and products launched in the last twelve months. A cross-case analysis is presented in table 12.

Table 12: Cross Case Analysis

Firm	Summary	Summary	Age (Years)	Employees	Markets Served	% ↟ Turnover	NPD - 12 months
Firm A	Family Firm	Low Growth	22	50	Domestic/UK	50 - 100 %	3 - 5
Firm C	Family Firm	Low Growth	28	28	International	< 50 %	1 - 3
Firm E	Family Firm	Low Growth	35	40	Domestic	< 50 %	1 - 3
Firm G	Family Firm	High Growth	9	160	International	> 100 %	> 5
Firm B	Non-family Firm	High Growth	38	48	Global	50 - 100 %	0
Firm D	Non-family Firm	High Growth	15	42	Global	> 100 %	> 5
Firm F	Non-family Firm	Low Growth	18	50	Domestic	50 - 100 %	> 5

Our findings when analysing the '*high growth vs low growth'* typology provide no evidence that the age of the organisation has any impact on the degree of firm growth. There is also no substantial association between the number of employees of LMT SMEs and firm growth. *Firm D, B, and G* are all considered *'high growth'* yet differences in the number of employees exist, ranging from less than forty-five to greater than one hundred and sixty. All *'high growth'* firms engage in more extensive international trade suggesting a relationship between markets served and higher growth. The attitude among *'low growth'* firms is that the domestic market is the easier market to grow as launching products that fit the needs of export markets segments is more difficult and costs a significant amount of capital, therefore, incentivising focus on domestic market growth. Additionally, it is no surprise that all *'high growth'* firms in the sample had average revenues of twenty-four million euro, compared with nine million euro for *'low growth'* firms. Thus, *'high growth'* firm's revenues provided larger sums of reserves to re-invest back into the firm's

innovation efforts. The implication of this is that '*low growth'* firms have fewer reserves and consequently have less scope for innovation development. Lastly, our findings highlight how '*high growth'* firms develop more products per annum compared to *'low growth'* firms. This is perhaps due to higher revenues that provide greater levels of cash flow to invest in new product development continually.

Our findings when analysing the '*family vs non-family'* typology suggest that *family* firms are mostly low growth, while *non-family* firms are mostly high growth. Our findings suggest that *family* firms often have diverse objectives to *non-family* firms, given they often exhibit a greater focus on maintaining and improving social responsibility and not just economic performance. Thus, this affects *family* firm growth rates and often diminishes their ability to achieve higher level growth associated with *non-family* firms. Table 12 also highlights how there is no correlation between the age and the number of employees of the organisation and the firm's family orientation. In terms of markets served, family firm's emphasise a greater focus on domestic markets by focusing their resources on increasing sales in markets where they have already established a presence. This is in part due to the risk-averse nature of *family* firms in comparison to *non-family* firms. According to *Firm C - Director:*

> *"There is business to be done in Ireland. Going abroad is harder, it costs you a lot more you know" Firm C - Director*

Thus, while it is less risky, the return on investment from a domestic market focus is often not as rewarding as export markets. *Non-family* firms, therefore, emphasise a greater focus on export markets than family firms and have higher growth rates since the additional capital generated through an export focus provides greater levels of cash flow and resources available to *non-family* firms to achieve this growth. Lastly, *non-family* firms develop more products per annum compared

to *family* firms, perhaps due to increased revenues providing greater levels of cash flow and out of necessity based on the demands of new markets.

4.3 Types of Innovation

Having gained an appreciation of the nature of the seven case companies, we now turn our attention to answer the first research question: *"Do LMT SMEs innovate to facilitate survival and growth?"*. This is tested through Tidd and Bessant's Four P's of Innovation Space as it is one of the most accepted categorisations in recent decades. This model categorises four distinct types of innovation such as product; process; position; and paradigm innovation. The following table 13 highlights the existence of these four types of innovation (Tidd and Bessant, 2007) across the seven case companies.

Table 13: Type of Innovation

Type of Innovation	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Product Innovation	94	✓	✓	✓	✓	✓	✓	✓
- Packaging Innovation	57	✓	✓	✓	✓	✓	✓	✓
Process Innovation	170	✓	✓	✓	✓	✓	✓	✓
Position Innovation	71	✓	✓	✓	✓	✓	✓	✓
Paradigm Innovation	1	✗	✓	✗	✗	✗	✗	✗

Assessing the relative importance of these innovation types within food SMEs, Table 13 highlights process innovation as the predominant type of innovation among the case companies, both in terms of quantity and strategic importance.

> *"It is on… process more than product. I would say 90% process" - Firm G - Director*

The importance of process innovation not only reduces the SMEs cost base to counteract advantage of economies of scale of larger firms but also provides new manufacturing capability that drives future product innovation. Process innovation was often perceived by the SME as low risk, given technology was often proven and commissioning factors controllable. Process innovation originated from three key sources within the cases; introduction of new equipment (often generic but in some scenarios, customised) into operations, purchase of second-hand equipment and its creative adaptation for purpose and the constant modifying of existing equipment for increased functionality and reliability

The second most important type of innovation for LMT SME is product innovation as it primarily contributes to the firm by increasing market share and potential profit margins. For this study, packaging innovation is included in the product innovation reference count, totalling one hundred and fifty-one references. This is the case as LMT SMEs within the food sector frequently engage in packaging innovations (Sonneveld, 2000; Ahmed et al., 2005) that are consistently related to product innovations. Position innovation is ranked in this study as the third most important type of innovation activity, emphasising the strong market responsiveness and internationalisation focus of some the case study companies. Paradigm innovation is only evident once across the seven case studies highlighting the lack of focus or perhaps an inability of these case studies to leverage paradigm innovation. The omission of paradigm innovation is not unexpected since such innovation requires considerable resources to effectively execute, something not explicitly evident in the cases studied.

The degree of innovation measures a firm's innovation intensity as being radical or incremental. Within each of the innovation types proposed by Tidd and Bessant's Four P's of Innovation Space

(2013), their degree of novelty can range across the incremental - radical spectrum. The following table 14 summarises the nature of the types of innovation analysed in this study.

Table 14: Summary of Degree of Innovation

Type of Innovation	Degree of Innovation	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Product	Incremental	✓	✓	✓	✓	✓	✓	✓
	Radical	✗	✗	✗	✗	✗	✗	✗
Process	Incremental	✓	✓	✓	✓	✓	✓	✓
	Radical	✗	✗	✗	✗	✗	✗	✗
Position	Incremental	✓	✓	✓	✓	✓	✗	✓
	Radical	✗	✗	✗	✗	✗	✗	✗
Paradigm	Incremental	✗	✓	✗	✗	✗	✗	✗
	Radical	✗	✗	✗	✗	✗	✗	✗

The trend across all types of innovation for each case study was predominantly towards the incremental side of the spectrum, with little to no radical innovation evident across the cases studied. This highlights the resource-constrained context of LMT SMEs that limit both the quantity and scope of innovation. Our findings suggest that this tendency to engage in incremental innovation rather than radical innovation was to manage risk and maintain the sustainability of the firm. This finding also reinforces the dominant design of LMT SMEs and reduces the potential for significant pivots that would enhance the novelty and value captured by LMT SMEs.

4.3.1 Product Innovation

Diving deeper into the first of the innovation types of Tidd and Bessant's model, namely product innovation, we not only find evidence of the existence of product innovation but also its importance to LMT SMEs, being ranked second highest type of innovation (after process innovation) among the case studies. One hundred and fifty-one references to product innovation were made across all primary and secondary data gathered during this research project. Findings suggest that LMT SMEs engage in incremental product innovation and avoid radical product innovation, in part, due to the perception among the case companies of the high risk associated with NPD in the food sector. According to Firm A: Director:

> *"only 10% of products launched remain on the market after a twelve-month period"*.

LMT SMEs attempt to reduce this new product innovation failure rate through incremental innovations, where market adoption is more predictable.

> *"We manage to exploit as much as we can from the [redacted] (preserves) market [in terms of NPD]... like vary X with something… like strawberry and Vanilla or strawberry, raspberry and rhubarb." - Firm E: Manager.*

However, this incremental product innovation comes with a diminished ability to capture higher profits.

The nature of these product innovations is either reactive in response to competitor action or proactive in pursuit of opportunity. While readily leveraging available knowledge and technology, product innovation is skewed towards a trial and error approach or DUI mode of innovation since all seven case studies rely on their agility to adapt their initial market offerings in response to feedback.

Each of the seven case studies launches between one and five new products to market per annum. However, one firm (*Firm B*) didn't engage in product innovation over the previous 12-month period as a result of being preoccupied with a major project that drained all their resources and re-diverted their attention away from NPD. Yet the firm's product innovations are typically the same as that of *Firm C and E* who reportedly launch between one and three products per annum. This is perhaps considered a high level of NPD for LMT SMEs, yet it is explained by the incremental manner in which these firms innovate, the ever-shifting market demands and the recognition of high product innovation failure rates, even when launching incremental product innovations, given customer conservatism and the competitiveness of the market.

> *"There is no month that goes by that we haven't changed something or added another* [redacted] *[product]... There is always change" - Firm G - Director*

Notably, incremental innovations do not require significant time or investment to bring to market (relative to radical product innovation). This along with multiple innovations reduces the risk exposure to SMEs of any one innovation failing and becoming a millstone around the neck of the firm.

Therefore, the product portfolios of the case study companies range between fourteen and forty products that are available for sale on the market. According to *Firm C*:

> *"NPD has always been very very gradual, steady and slow. Like we have 14 products in our range [over a] 28 years [period], so that's not overly fast." - Firm C: Director.*

Firm F is an exception as they engaged more frequently in product innovation than any other case study company. According to the Director:

"There would be 350/400 [product SKU (stock keeping unit)]. So there are 350/400 revenue-creating products coming out this door". - Firm F: Director.

This firm has been established for less than 25 years, yet they have a higher frequency of product innovation since they are required by consistent demands from multiple customer channels including butchery and industrial customers to engage in NPD. Acknowledging the high rate of product innovation in such firms, we next explore the main drivers of product innovation.

All case studies are generally driven by the same three factors for product innovation including the ambition to grow, the desire to target a new market, and the need to diversify product offerings. Firstly, the firm's growth ambitions are a central driver for incremental product innovation as the cases studies included in this research aim to achieve between an 8% and 12% increase in revenue through NPD per annum. This is considered a substantial degree of growth for these LMT SMEs and therefore a major incentive to engage in product innovation. It is, therefore, no surprise that these firms bring new products to market each year as they constantly strive to grow.

Secondly, product innovation allows firms to target new markets by repositioning their products, both domestically and internationally. While this type of product innovation may be considered radical since the firm is diversifying their product offering, it is believed to be incremental as they already have the necessary resources and capabilities to engage in this type of innovation. Thus, there was no radical change in the production process. In the context of this study, this driver of product innovation is frequently achieved by improvements in product shelf life.

Lastly, product innovation is driven by the need to differentiate products from competitors by creating a unique selling point (USP) (Francis et al., 2008) that provides the ability to charge premium prices due to differentiation, the opportunity to target new markets and create loyalty among customers.

4.3.1.1 Packaging Innovation

In analysing the nature of the product innovation, a sub-category, important to the food sector emerged, that merited discussion. Packaging may normally be perceived as a by-product of product innovation yet within our research, it was in incidents, a category in its own right. The importance of packaging innovation in the food sector is frequently evident in the literature since "*packaging innovations have been quickly accepted by food manufacturers, because of the reductions in production costs, and the need for attractiveness on the supermarket shelves. Environmental criticisms of packaging are pressuring changes to reduce waste and aid recycling"* (Earle, 1997, p. 172). See also (e.g. Koss, 2007; Wells et al., 2007; Mahalik and Nambiara, 2010; Trott and Simms, 2017). Similar to product innovation, all packaging innovations across all cases were incremental in their rate of change, reinforcing the moderate approach of LMT SMEs concerning innovation activity. Fifty-seven references were made to incremental packaging innovations, while no radical packaging innovations were evident among the case studies. Evidence of incremental packaging innovations is provided by *Firm B: Manager.*

> *"If we make a product that is more convenient by slicing [and packaging] it for the person, then you have a license to charge more."*

This also highlights a connection between packaging innovation and position innovation as additional value is provided to targeted convenience customers. To outline the spectrum of packaging innovation, the most novel packaging innovation was described by *Firm A: Manager*.

> *"We designed the box to fit the shelf… we changed the size of the* [redacted] *[product], we changed the size of the plastic acetate. We [also] designed the box on the optimum space utilisation on the pallet, which meant… I was actually shipping the product to* [redacted] *[location] for free. Because we got extra* [redacted] *[product] onto the pallet."*

Thus, while there was no evidence of radical packaging innovation among any of the case companies, the outcome of some of these innovations was significant for the firms as is the case of Firm A, as they reduced their transport costs The following table 15 reflects the drivers of packaging innovation.

Table 155: Drivers of Packaging Innovation

Drivers	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
NPD Demands	✓	✓	✓	✓	✓	✓	✓
Integration of Recyclable Material	✓	✓	✓	✓	✓	✓	✓
Improved Aesthetics	✓	✓	✓	✓	✓	✓	✓
Repositioning	✓	✓	✗	✓	✓	✓	✓
Longer Shelf Life	✓	✗	✗	✗	✗	✗	✓

The drivers of packaging innovation are similar for the majority of firms which include NPD demands, societal pressure to reduce and eliminate single-use plastic, improving the product aesthetics, repositioning, and increasing product shelf life, due to the perishable nature of some

products. The most common driver of packaging innovation is the high level of product innovation that often requires the development of new packaging since it is unlikely that existing packaging is suitable for new products. Thus, firms have no option but to continuously innovate within their packaging if they continue high levels of NPD.

Secondly, all case studies engage in packaging innovation driven by the need to reduce the harmful impact their packaging has on the environment due to consumer pressure. Yet, none of the seven case studies has managed to completely change over to 100% recyclable packaging to date. According to the case studies, this problem is being pushed back to suppliers since LMT SMEs do not invest a sufficient level of capital in R&D to bring this type of radical innovation to market. Instead, LMT SMEs depend on the HT classification to introduce radical packaging innovations as they adopt technologies to provide a solution to their packaging problems. While they are not ignoring the current demands of their customers to eliminate the use of single-use plastic, they are relying on suppliers to introduce this new packaging.

Thirdly, packaging innovations are also driven by the need to enhance the visual aesthetics of the firm's products. All seven case studies emphasised the competitive advantage that the visual appearance of their product can bring over competitors. It is not only important for the end customer but it is considered a major selling point for retailers as this increases customer loyalty and improves customer experience.

Fourthly, six of the seven cases engage in packaging innovation to reposition products to target new customer segments. While no element of the product was changed, existing products were

repackaged to open up a new market e.g. *Firm F* developed a single serving pack rather than multiple servings to target a different market segment.

Lastly, increasing product shelf life is a core driver of packaging innovations for *Firm A, and G* based on the perishable nature of their goods. They continually increase product shelf life to open up new markets both domestically and internationally as retail customers and end customers are always looking for longer shelf life. While the impact of these packaging innovations could be considered by many as radical, the technology and material used to engage in these innovations already exist in the food sector.

To summarise, product innovation in LMT SMEs occurs at a much higher frequency than expected, due to the incremental nature of product innovations and the constant competitive demands of the market. It is achieved by adopting a DUI or trial and error approach to innovation that is adaptive and reinforces the incremental nature of product innovation. The core drivers of product innovation include the growth ambitions of the firm, new target markets, and to differentiate from competitors which all contribute to LMT SME survival and the growth. Engagement in product innovation also leads to links with the other types of innovation outlined by Tidd and Bessant's Four P's of Innovation Space. Product innovation is linked with process innovation as process innovations are often necessary to enhance the capabilities of the firm to deliver product innovations. Additionally, product innovation is linked to position innovation as product innovations can facilitate the organisations repositioning of products in new contexts.

4.3.2 Process Innovation

The second category of innovation outlined by Tidd and Bessant's Four P's of innovation space is process innovation, highlighted as the predominant type of innovation undertaken within the case studies. LMT SMEs engage exclusively in incremental process innovations while no radical process innovations were evident across any of the case studies. This indicates a conservative nature when allocating resources to process innovations, perhaps due to the notion that the potential impact of radical innovations is difficult to predict and expensive to implement. In this study, the process innovations of the case studies range from the use of digital technologies, improvements in manufacturing facility layout, the purchase of machinery (new or used), building handmade machinery, the use of renewable energy sources, improvements in production processes and firm capacity improvements (see Table 16).

Table 166: Types of Process Innovation

Process Innovation	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Purchase Machinery	61	✔	✔	✔	✔	✔	✔	✔
- Hand Built	13	✔	✘	✔	✔	✔	✘	✘
- Firm Capacity	11	✔	✔	✔	✔	✔	✔	✔
Improve Production Process	37	✔	✔	✔	✔	✔	✔	✔
- Facility Layout	4	✔	✘	✘	✘	✔	✔	✘
Digital Technology	15	✔	✔	✔	✔	✘	✔	✘
Renewable Energy	12	✔	✘	✔	✘	✔	✔	✘

Our findings highlight how all case studies engage in similar types of process innovations. Two of the four main types of process innovation are engaged in by all case studies including the purchase

of machinery and improvements in production processes. The most common source of process innovations was a consequence of the purchase of both new and second-hand machinery leading to increased automation, quality and reliability of production.

> *"To fill the 50,000 pots I think it took seven days by hand. 50,000 pots we would [now] knock out in half a day." - Firm E: Director.*

While the consequences for the firm are radical, this is considered incremental since the improvement came about through the purchase of machinery based on existing technology that already existed in the food sector. Thus, process innovation was often perceived by the SME as low risk, given technology was often proven and commissioning factors controllable. Hence, there was no radical degree of innovation novelty.

Furthermore, four of the seven case studies developed handmade bespoke equipment providing the opportunity to increase the firm's manufacturing capacity, develop new products, and increase product consistency. This is reflected in the following statement from *Firm E: Manager.*

> *"If a machine is broken or if we needed some part or if we needed some new machine to do some new thing, [redacted][Director] would build it. We wouldn't go buy it"*

This is a consequence of the strong process knowledge and technical expertise of the entrepreneur which gives rise to creative innovations through the DUI mode of innovation. This is perhaps due to the limited resources available which require the organisation to rely on its capabilities.

Additionally, a common issue among all seven case studies is the lack of capacity to produce the necessary volume of product required to satisfy the market. Almost all firms wait until they are at

full or close to full capacity within their manufacturing facilities before they risk reinvesting in their production capacity, due to the high costs associated.

Production process improvements are changes in how the firm is producing products *(42 of 170 references)* and reflects how firms improve particular aspects of their production process, experienced across all seven cases. According to *Firm E: Manager:*

> *"what we decided is to do four long working days instead of five shorter. So we start at 5 in the morning and we work until about 6 in the evening ... Most of our workers work four days, which seems, they seem to like it… So we have tried to innovate in things like that."*

These types of process innovations are regularly brought about by the firm director or upper-level managers who identify issues that inhibit production floor operators working efficiently. While process innovations are incremental, they can have a significant impact on the productivity of the production process.

Process innovations are also implemented through improvements in the layout of firm facilities *(4 References of 170)*, across three of the seven cases where the production process is redesigned to increase efficiency and streamline the manufacturing process. Firms continuously innovate by making changes to their plant and production layout, such as the reallocation of office staff so that they are near each other.

While the majority of process innovations are brought about by improvements in firm equipment and machinery, process innovations are also implemented through the use of digital technologies *(14 references of 170)*, reflected in five of the seven case studies.

"It's a computer system by which all production, sales, management accounts, customs and excise records are automated... We must return a warrant to the customs and excise every month. [redacted] (Engineer) wrote computer software that automated this process and he can generate what was taking us [Two Directors and one Administrator] about a week's work in about 11 seconds now." - Firm D: Director.

While the outcome of these innovations is often radical for these LMT SMEs, the innovation themselves are incremental as this technology already existed.

Incremental process innovation improvements in renewable energy systems *(12 References of 170)* to reduce waste and increase firm efficiency was also evident across all seven case studies. LMT SMEs consistently strive to decrease operational costs by introducing renewable energy sources. All case studies engaging in this type of process innovation gave significant credit to Origin Green *(sustainable food production programme by Bord Bia)* throughout their descriptions of these process innovations highlighting the influence of policy and state-supported agencies.

Acknowledging the high rate of process innovation in such firms, we next explore the main drivers related to process innovations across all seven case companies. These include the firm's growth ambitions, the desire to improve cost efficiency and increase production speed. Firstly, the most significant driver for process innovations is to increase the growth of the firm, common among all case studies. Firms consistently engage in process innovation to change certain product attributes that provide the opportunity to target new markets:

"We started off… they were at a 14-day shelf life. Ah, then we went to 18 [days] and now we are at 25 days and how did we do that? So you do it through innovation. But mostly

innovation in processes. So it's extending your shelf-life through closed line technology." - Firm A: Director.

Engaging in process innovation can lead to improvements in product attributes such as shelf life, product consistency and product quality providing the opportunity to target new markets such as export markets and new departments with retail stores, likely leading to growth for the firm.

Secondly, the financial value captured from process innovations through more cost-efficient processes is a major driver for these case studies.

"If we can save a tiny percentage… It all adds up, you know. If I can save half a cent in every [redacted](Dairy product) produced, that's a huge saving at the end of the year." - Firm A: Director.

It is no surprise that process innovation is the most frequently engaged type of innovation since these process innovations bring about radical benefits in terms of cost savings for the firm. Further, process innovations lead to a reduction in the labour units required, thus driving down cost or providing the opportunity to redeploy labour units to areas that have been neglected.

Lastly, increasing the speed of the production process through process innovation was evident across all seven cases. According to *Firm F: Director.*

"The small tank will process a 500-kilo tank in 2 and a half hours, the 750 [kilo tank] will process in 2 hours and the Maserati [second- hand equipment] will cook a tonne of [redacted] (preserves) in 45 minutes."

The increase in the speed of a firm's production process leads to greater productivity and greater cost efficiencies.

In summary, LMT SMEs engage predominantly in incremental process innovation over any other type of innovation activity. While many of these innovations bring about radical benefits, they cannot be classified as radical innovations. These case study companies included in this study are highly motivated to engage in process innovation to drive the costs of production down, increase the speed of the manufacturing facilities, improve product consistency and continuously increase organisational growth. This combined supports the organisation's attempts to remain competitive.

4.3.3 Position Innovation

Position innovation is the third most common type of innovation evident in this study. The nature of position innovation among LMT SMEs in the food sector is incremental while no radical innovations were recorded. Thus, indicating a conservative nature among LMT SMEs in allocating resources to position innovations, perhaps due to the high costs, unpredictability and uncertainty regarding the outcomes of these innovations. The spectrum of incremental innovations is further understood through the following types of position innovation.

Table 177: Types of Position Innovation.

Position Innovation	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
New Market	39	✓	✓	✓	✓	✓	✓	✓
- New Brand	3	✗	✗	✓	✓	✗	✓	✗
- Online	2	✗	✗	✓	✗	✓	✗	✗
New Department	7	✓	✗	✓	✗	✓	✗	✗

The seven case study companies engage in a variety of position innovation types. Only one common type was evident, where the case studies targeted new markets both domestically and internationally with both existing and new products. In total, there were *(thirty-nine references)*, making it the most frequently engaged type of position innovation. These targeted customers, in the context of this study exist as retailers, food service, butchers, and industrialists. According to *Firm A:*

> *"you could target... say all the* [redacted] *(new market) with... you know if you had a* [redacted] *(new product) … then you could have* [redacted] *(new packaging) that you can maybe slice and freeze that you could maybe put in with various* [redacted] *products" - Firm A: Manager.*

Position innovation often requires engagement in product innovation and also packaging innovation to fit the requirements of the new customer segment. Furthermore, engaging in position innovation is also carried out by the development of a new brand to target a new market, referenced three times across three case studies. The opportunity to develop a new brand often comes about due to new trends in the marketplace, often identified in both domestic and international markets. Common among case study companies was that they already had the existing capabilities to take advantage of the new trends and no new capabilities needed to be developed to engage in position innovation.

Additionally, two of the seven case study companies are attempting to sell their products online through e-commerce platforms. The motivation for doing this, according to the interview participants, is two-fold. The first is that these e-commerce platforms will increase overall sales and drive growth by opening up previously inaccessible new markets. The second driver is the

ability to gather data from online sales that would highlight what products are most frequently bought and what ones are struggling to gain traction. This could then be used as a sales tool to provide evidence to retailers that a certain product is likely to be successful. If the product already has a high sales volume online, then there is a major incentive for a retailer to list the product. This could also be used as a tool for NPD and R&D as large amounts of data on customer buying habits could be gathered and analysed.

The second most frequently engaged position innovation was targeting new departments within existing customers stores *(seven references)*, evident in three (*Firm A, C, and E)* of the seven case study companies. In the context of *Firm A*, traditionally the firm's products were located in the back-end of the store in family packs. However, *Firm A* engaged in product innovation that targeted a different customer segment (the *'food to go'* section) at the front of the store meaning products target convenience customers, single people, or the *'food on the go'* market who have previously not been targeted. This position innovation has opened up a whole range of stores that previously refused to stock *Firm A's* products as they didn't align with their customer requirements. It is estimated by *Firm A: Manager* that this will open up at least an extra 20% to 30% more stores, inaccessible to them in the past. While the degree of innovation here is believed to be incremental, the outcome of the innovation could be considered radical as *Firm A* accessed a new position in retailers stores and also gained access to a new range of previously unattainable customers. Thus, the implementation of these innovations is more straightforward and less expensive for LMT SMEs.

We next explore the three main drivers of product innovation that exist among all case companies. These include ambitions for firm growth, specific customer requests, and existing firm capability. The desire to increase revenue through firm growth is achieved in a multitude of ways in terms of position innovation. Firstly, the cases engage in different types of product and packaging innovation that allows them to charge more for the same product. According to *Firm B: Manager:*

> *"If we make a product that is more convenient by slicing it for the person then you have a licence to charge more"*

This type of position innovation involves targeting convenience customers and extracts more revenue per unit sold due to the price increase. Also, growth is achieved by selling products through e-commerce platforms, to new departments in-store, and developing new brands that target new customers.

Secondly, position innovation is driven by consumer requests as firms that target new markets such as food service, butchery, industrial and retail *(e.g food to go)* are often incentivised to do so based on customer demand. These requests are major drivers for the case studies to engage in incremental position innovation, evident right across the seven cases.

Lastly, all case studies rely on the existing capabilities of the firm to engage in position innovation as no firm diverged too far from their core capabilities. While firms often engage in NPD to engage in position innovation, they typically only rely on existing production capabilities. While this may imply that LMT SMEs rely heavily on internally controlled resources and assets to engage in position innovation, this is not solely the case as significant evidence of collaboration is present.

However, the collaborations with external entities do not diverge too far from their business innovation efforts.

The main findings associated with position innovation is that these LMT SMEs are predominantly focused on identifying new markets and launching products into these new markets by targeting new customer segments. Internationalisation and new market development are largely organic and develop slowly rather than one big initiative. In the context of the food sector, the case companies all engage in position innovation to segment the market and target new customers using new types of products and packaging. Currently, there is huge demand, according to the case studies, to target convenience customers who are looking for products that take little or no time to prepare and can be easily consumed. This is driving some case companies to make changes to their products and or packaging to position themselves in line with these types of customer segments, which further explains the high degree of position innovation.

4.3.4 Paradigm Innovation

Paradigm innovation, representing a fundamental shift in the firm's nature, was least evident in this study. This is due to the high risk associated with paradigm innovation as they are generally assumed to be radical, which doesn't align with the incremental perspective often implemented by LMT SMEs. Additionally, the resource constraints of LMT SMEs limit the capacity of these firms to engage in all types of innovation consistently and so less attention is diverted to paradigm innovation. Evidence of paradigm innovation was experienced only once in the analysis across all seven cases. This paradigm innovation was implemented by *Firm B* as they outsource production for a specific export market in that market itself by forming a strategic partnership with a contract

manufacturer. This paradigm innovation was driven by regulation as *Firm B* is prevented from exporting some of their products directly into said export market, encouraging them to identify an alternative route to market. Thus, while there is a change in the firm's business model, the change is incremental as the innovation doesn't involve a high degree of world-first novelty. A key driver of paradigm innovation includes the growth ambitions of the firm, also considered to be the main driver of all types of innovation, and customer requests as *Firm B* were consistently receiving requests from customers to sell their products into ex-pat markets. LMT SMEs often refrain from engaging in this paradigm innovation due to the high risk associated with a change in the firm's business model. Since these case studies are predominantly engaging in incremental innovations, it doesn't align with the nature of innovation engaged in by the firms. Paradigm innovation is something that evolves as a result of the success of the other three types of innovation and takes significant time for transition to occur.

4.3.5 Cross Case Analysis - Type of Innovation.

In our cross-case analysis, we examine the types of innovation across all seven cases through the dichotomies of '*high growth vs low growth'* and *'family vs non-family'* firms. Our findings suggest that there are equal levels of product and process innovations among *high growth* vs *low growth* firms across all seven cases. Additionally, only one instance of paradigm innovation was evident, in a high growth firm, across all seven cases. Thus, the only distinction reflected in our findings across all cases highlights how *'high growth'* firms engage in additional position innovation in the form of internationalisation. Further, our findings from the analysis on *'family vs non-family'* firms suggest no distinction between the types of innovation engaged in by the seven cases.

In summary, the scope of innovation for LMT SMEs is concentrated on process, product (including packaging) and position innovation, happening regularly within firms. Innovations are largely incremental in nature, perhaps due to reservations based on fears of losing the venture, risk-averse attitudes, conservative approach to market entry due to high competition, or firm resource constraints. These constraints exist not just as a lack of capital but also the scarcity of time, capacity and education. This is the case right across all types of innovation outlined by Tidd and Bessant's four P's model. While process innovation is the predominant focus for LMT SME innovation activities, a significant amount of firm resources is diverted to product innovation due to the close alignment between product and packaging innovation in the food sector context. Position innovation is often a consequence of product or process innovation and is therefore not a key focus of LMT SME innovation efforts. This may be the case as product and process innovations are operational while position innovation is more strategic. Often engagement in one type of innovation leads to innovation in other areas. For example, process innovation in LMT SMEs can lead to innovations in product and position innovation and vice versa. Lastly, little to no evidence of paradigm innovation was present among LMT SMEs due to the high risk associated. The innovation activity of these firms is predominantly driven by the centrality of the entrepreneur (O'Sullivan et al., 1998), the market knowledge among upper-level managers, and the need for continuous growth.

4.4 Innovation Process Model

Now that we have evidence that LMT SME firms within the food industry do innovate both frequently and across the spectrum of innovation types suggested by Tidd and Bessant's 4 P's of innovation space, we now turn our research attention to address the second research question:

"*How do LMT SMEs manage their innovation activity?"*. This aspect of the research focuses on Tidd and Bessant's Innovation Process Model. The innovation process is the pathway which innovations develop from fledgeling concepts to commercially beneficial realities for the firm. This process (for simplicity sake) is often presented as a linear funnel, consisting of multiple related phases. An organisation's innovation process can be understood as the formulation, selection and transformation of ideas into an innovation (Jacobs and Snijders 2008).

Tidd and Bessant (2005) identified four related phases of innovation as search, select, implement and capture value by which innovation is achieved. Also included in the model are firm resources innovation strategy. Our findings highlight how LMT SMEs are characterised by a culture of informal, unstructured and reactive decision-making processes (Pullen et al, 2009) that are responsive to market demands and changing trends (Terziovski, 2010; Hirsch-Kreinsen, 2015; Tidd and Bessant, 2018). Thus, while management of the Innovation Process is evident in all cases studied, its nature is often implicit and ad hoc, centralised with several key individuals (e.g. entrepreneurial MD). As a consequence, while phases of the innovation management process are sometimes proactive, most phases are reactive to a stimulus as part of the 'trial and error' approach.

Table 188: Innovation Process Model.

Innovation Process	Number of Transcript References
Search	195
Select	111
Implement	62
Capture Value	104

Our analysis of how LMT SMEs manage their innovation activity through the lens of Tidd and Bessant's Innovation Process Model highlights how the directors and management teams of LMT SMEs implicitly oversee and manage the four phases of the process, some in greater detail and with a better understanding than others. Particularly clear is the search, select and capture value phases as the case studies rely on multiple sources of inspiration when searching for innovation, adopt multiple techniques for selection, and have a clear understanding of the value they look to capture. However, the main challenge for the case studies exist when implementing innovations. Our findings highlight how these phases often become embedded in routine practices and can be characterised as conservative.

4.4.1 Search

In terms of the search phase of the innovation process model, one hundred and ninety-five references were made across twelve different search methods throughout the analysis of the data collected. Unsurprisingly, the directors and upper-level managers are key to the search phase of the innovation process model, due to the centrality of the entrepreneur reflected in the literature. The types of search methods are presented in the following table 19, supported by the number of references to the search process during the data analysis.

Table 19: How Firms Search for Innovations.

Sources	Search	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
External	Market Research	79	✓	✓	✓	✓	✓	✓	✓
	- Abroad	23	✓	✓	✓	✓	✓	✓	✓
	Customer Request	35	✓	✓	✓	✓	✓	✓	✓
	- Trade Shows	7	✓	✓	✓	✕	✓	✕	✕
	R&D	21	✓	✕	✕	✓	✓	✓	✓
	Supplier Driven	11	✓	✓	✓	✕	✕	✓	✓
	Benchmarking	9	✓	✕	✕	✓	✓	✓	✓
	External Collab	9	✕	✓	✓	✓	✓	✓	✓
	- Government Aid	3	✓	✕	✕	✕	✓	✕	✕
Internal	Experimental	20	✓	✓	✓	✕	✓	✓	✕
	Internal Collab	11	✓	✓	✓	✓	✕	✓	✓
	Identifying problems	7	✕	✕	✓	✓	✓	✕	✕

Each case study predominantly engages in the same types of search processes while no exception or particularly dependable search process is unique to any individual firm. The following section discusses the types of search methods under the dichotomy of internal vs external sources.

4.4.1.1 External Source

LMT SMEs in this study rely most significantly on market research *(seventy-nine references)* when searching and scanning for innovative ideas. Market research involves gathering information on the needs and preferences of existing and potential customers while also engaging in market profiling. This involves an analysis of the size of the market, its competitors, and the capabilities and resources required to innovate in this area. All seven cases rely on market research when

searching for product, process and position innovations. The most common type of market research in this study involves browsing online sources, typically conducted by directors and upper-level managers to identify new trends and new machinery. In addition, a common source to conduct market research is abroad since these cases depend on foreign markets to inspire their innovations. There were twenty-three references across all seven cases to searching abroad for innovations including product, packaging and process innovations. According to *Firm A: Director:*

> *"We always keep an eye on retail just to see what's happening in the UK… For example, Marks and Spencer's would be the most innovative operation over there... we were in the States last year to see how they were innovating over there"*.

While online sources were referenced continuously as sources of easily accessible, highly valuable information, travel is still considered by many, to be a fundamental requirement when seeking inspiration for innovations.

Further, the case study companies search for innovations by seeking out customer's feedback, suggestions and requests for change. This is the second most frequently engaged *(thirty-five references)* search process for product innovations. This information comes in two forms such as requests from retail, food service or industrial (business to business) customers who issue a mandate to the firm to produce a specific product. While this is the search phase as it inspires the innovation activity, it is also the select phase since the commercial customer has the final say on what is produced. Secondly, requests come directly from retail customers (business to consumer). These suggestions are often made at trade shows *(seven references).*

> *"We don't employ big market research companies or anything. We talk to people and we talk to our own customers and when we go out to shows... we will be talking to thousands*

of people at the ploughing [championships] in mid-September and we would very much take on board what people say." - Director B.

Three of the seven case studies provided evidence of this type of search process. This provides a huge amount of data that the firm must analyse and process. If the same criticism or suggestions are repeatedly highlighted, then action is taken.

Research and development (R&D), while being less than three per cent of overall expenditure in the context of LMT SMEs is also a common search process *(twenty-one references)* for product, process and position innovations among LMT SMEs in the food sector. R&D is defined as *'experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view'* (OECD, 2015). Five of the seven case study companies claim to engage in R&D when searching for innovations. The R&D activity of these case companies is often in the form of collaborations with research centres, government agencies and consultants. While more references were made to R&D throughout the interviews, some interview participants' view of R&D didn't align with the definition applied to this research. Thus, those references were considered to be market research and were coded to that search process.

Collaborating with individuals and entities external to the firm proved to be frequently exercised *(nine references)* during the search phase for product and process innovations. Only one of the seven cases provided no evidence of external collaboration during the search phase. LMT SMEs in this study reflected particularly strong capabilities when it comes to communicating with external stakeholders. According to *Firm C: Director*.

"[The machinery cost] €120,000… some guy in the UAE was looking for (preserves) [redacted] *in Dubai and I replied to him saying where you can get it... and he was like 'oh I used to work in (large food manufacturer)* [redacted] *when it was in Ireland and if you ever need any help [I may be able to assist]...' and I just said that we were trying to get one of these [machinery] and he pointed me in the direction of a company that was selling a smaller version of it for like €40,000 and it meant we could now automate the filling of the (product)* [redacted]*. You know, so it's a massive saving. So it's much much quicker and it's softer on the product... less handling on the product. So it's a better product as well."*

The ability to communicate and collaborate with external entities provides significant opportunities when searching for innovations as the outcome for the firm can be quite radical. These benefits are often experienced through NPD, improvements in efficiencies, and improved product quality. A subsection to external collaboration is the search for innovations through government aid *(three references)*, evident in the product innovations of three case studies. While this search process has been implemented by three of the case study firms, none of the case studies depend on government aid or funding when searching for innovations to any significant degree.

Pavitt's (1984) typology suggests that firms within the LMT classification are referred to as '*supplier dominated firms'*. However, the impact of suppliers on the cases innovativeness isn't as dominant as suggested by Pavitt since only ten references were made to suppliers throughout the search for process and product innovations. According to *Firm A: Director:*

"There is hardly a week that goes by that there isn't some company rolling in trying to sell something that's going to be energy efficient or that's more innovative in energy or is going to save x, y and z."

However, in the context of food sector LMT SMEs, there is a high dependency on the internal skills and resources of the firm required to engage in process innovations. These firms consistently rely on their engineering capabilities and depend less on suppliers of machinery to engage in process innovation. This is in part, due to the resource constraints of food sector SMEs since developing bespoke manufacturing processes are often implemented by the case studies to reduce the cost of the innovation. In terms of product innovation, one of the seven case studies rely on the suppliers of their ingredients to develop new products. They are influenced by what can be produced in Ireland and so decisions around product innovations are dependent on what can be supplied by Irish producers.

4.4.1.2 Internal Source

The first internal source of inspiration in the search phase is experimentation with different types of products and machinery. Twenty references were made to product and process innovation experimentation among five of the seven case studies.

> *"We have experimented with stevia and other sweeteners... But they are very chemical types." - Firm E: Director.*

Experimenting with different ingredients, products, and machinery provides the opportunity for innovation across all types including position and paradigm since innovation in one area can have a major influence on another innovation.

Internal collaboration refers to the individuals within the firm collectively searching for innovations. References to internal collaborations as a search method for product and process innovations were recorded eleven times. This type of search for innovations predominantly

involves directors and upper-level management working together to identify and analyse the potential of emerging opportunities. According to *Firm A: Director:*

> *"NPD manager, marketing [manager] and then myself and* [redacted] *(2nd Director) are the four key people on that. But that's not to say that the guys in sales don't have a say either."*

Internal collaboration throughout the search process was most common among directors and upper-level management, highlighting the centrality of the entrepreneurs and senior management in LMT SMEs. Only one of the firms interviewed in this study provided no evidence of this dependency on internal collaboration at any stage of the search process.

Benchmarking involves finding, analysing and reproducing innovations based on existing innovations of other firms or industries. There were nine references made to benchmarking when searching for product and process innovations.

> *"The process efficiencies that we have instigated in (Firm D)* [redacted] *are about taking existing technologies that exist and other industries and bring them to the (beverage)* [redacted] *domain." - Firm D: Director.*

While *Firm D* benchmark against technologies and process innovations from other industries, evidence of benchmarking against competitor products was also experienced. In total, five of the seven case studies benchmark against specific products or processes. The remaining two firms that refrain from this type of search process displayed a strong adverse attitude against this type of search process. However, the specific reason these firms do not engage in this search process was never justified.

Lastly, the final internal source used in the search phase involves identifying problems that they can go about searching for specific solutions. This method was referenced seven times across three of the seven cases when searching for process innovations.

> *"So this is the jar and you can see the little centre here... you know the way it [the product lid] pops if it has been open? So sometimes this pops and so… There is a huge amount of waste. So they brought in some new equipment and… it basically stops this [product lid] popping, reduces the waste and then we have a lot more product to sell." - Firm C: Manager.*

Firms often face problems within their manufacturing processes and so they rely on their ability to identify problems to effectively search for solutions that overcome these issues. Table 20 below highlights the search strategies implemented to achieve different types of innovation.

Table 200: Search Source for the types of Innovation

Search Source	Product Innovation	Process Innovation	Position Innovation	Paradigm Innovation
Market Research	✓	✓	✓	✓
- Abroad	✓	✓	✓	✕
Customer Request	✓	✕	✓	✓
- Tradeshow	✓	✕	✕	✕
R&D	✓	✓	✓	✕
Experimental	✓	✓	✓	✕
Internal Collab	✓	✓	✕	✕
Supplier Driven	✓	✓	✓	✕
Benchmarking	✓	✓	✓	✓
External Collab	✓	✓	✓	✓
- Government Aid	✓	✕	✓	✕
Identifying problems	✓	✓	✓	✓

The table above gives us a clear view of the variety of sources used by the case studies when searching for different types of innovation. This table also reflects the level of focus given to each type of innovation. More sources exist for product, process and position innovation rather than for paradigm innovation since these are the most common types of innovation for these LMT SMEs. Thus, it is no surprise that there are fewer sources related to paradigm innovations.

When searching for product innovations, the case companies apply all twelve sources. It is no surprise that these sources for product innovations are well defined and understood by the organisation, due to the frequency of product innovation. While the case companies rely on fewer sources for process innovation, they have clearly defined methods for searching for new ideas. It

is understood that this is the case due to the relevancy and availability of options in terms of process innovations as these are linked, in many cases, to a felt need that requires a timely response, while product innovation is more ongoing and is often a response to a market change. Additionally, only three of the same sources applied to product innovations were not applied when searching for process innovations. Thus, these LMT SMEs depend on fewer sources when engaging in process innovation, which may suggest the search methods for process innovations are more successful and therefore fewer search methods are necessary. The case studies apply ten of the sources to engage in position innovation. While position innovation is less common among these LMT SMEs, it remains fundamental to the innovativeness of the case study companies. The number of sources for position innovations is closely related to the link between product and position innovations. Finally, since paradigm innovation was only evident among one of the seven case studies, it is no surprise that the number of search strategies is considerably lower than any of the other types of innovation. The majority of these firms do not engage in paradigm innovation and so only five of the twelve sources were applied. The complexity of this type of innovation is reflected since numerous different sources were necessary to achieve paradigm innovation, while only one source was necessary for product and process innovations. Thus, it is no surprise that these firms were inclined to avoid this type of innovation due to its complexity and high risk of failure.

4.4.2 Select

This phase of the innovation process model is closely aligned to the firm's strategy and the innovation culture of the organisation since firms only select innovations that fit their innovation strategy and culture. The process of how these firms select an innovation is quite clearly defined as all seven firms have established thorough selection methods to increase the likelihood of

innovation success. When selecting innovations to progress, eleven different techniques were highlighted while one hundred and eleven references were made across all seven cases. The types of selection methods are presented in table 21. This is supported by the number of references that were made to the selection process throughout the data collection process.

Table 211: How firms select an Innovation to progress.

Select	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Customer Selection	29	✓	✓	✓	✓	✓	✓	✓
Market Research	25	✓	✓	✓	✓	✓	✓	✓
Collaboratively	15	✓	✓	✕	✓	✓	✓	✕
Director Decision	14	✓	✕	✓	✓	✓	✓	✓
- Instinct	14	✓	✓	✓	✓	✓	✕	✓
- Management Decision	11	✓	✓	✓	✓	✕	✓	✓
Scalability	9	✓	✓	✓	✕	✕	✓	✓
Existing Capability	7	✓	✕	✓	✕	✕	✓	✕
Firm Fit	6	✕	✓	✕	✓	✓	✕	✕
Regulation	3	✕	✓	✕	✓	✕	✕	✕
Differentiated	3	✓	✕	✕	✓	✕	✕	✕

It is clear that each case study predominantly engages in the same types of selection processes. No clear exceptions exist as a minimum of two of the seven cases engage in each type of selection method. The following section looks at the types of selection processes in order of the highest number of references to the lowest.

LMT SMEs don't always decide on what product innovations to progress or what changes to make as business to business customers such as retailers own-brand products, food service, butcher and industrial customers make the selection.

> *"It is the customers [retailer, food service, butcher, and industrial customer] decide it. They decide at the end of the day what tweaks they want on it and what changes they want." - Firm F: Manager.*

While the cases get input into the decision and their opinion is highly valued, ultimately it is the business to business customer that makes the final decision on what innovation is accepted, often through the use of product taste tests. There were twenty-nine references to this type of selection process across all seven firms, making it the most frequently engaged selection method used by these LMT SMEs. However, when selling directly to the retailer's end customer, the firms have total control over the selection of product innovations. While the firm makes the final decision on what innovations to progress, it was highlighted that this selection is significantly influenced by the customer since consumer taste panels are used to provide data that directs the firm on what product should be introduced. Thus, it can be argued that it is the retailers end consumer that chooses which product innovation to progress.

LMT SMEs in this study are becoming increasingly dependent on market research to make more informed decisions. Relying on market research was referenced twenty-five times across all seven cases in terms of selection methods.

> *"It is very rarely instinct. I would say to be honest with you to try to bolster an argument that I believe... This is very hard because obviously, we put a lot of investment into R&D [research]... so you do need to supply some level of facts." - Firm E: Director.*

The upper-level management of these firms is transitioning from a reliance on entrepreneurial instinct and *'gut feeling'* to a dependency on market research. Engaging in position and paradigm innovation also depends on market research activities since the cases investigate the target customer, the size of the market and the competitive landscape. This research is conducted internally, by the marketing department or marketing individuals but also by relying on information provided by organisations such as Bord Bia. Thus, these firms have transitioned from reliance on instinct, characterised by high-risk, to a more objective market research approach to decision making, characterised by lower risk.

The selection of innovations often involves collaboration among upper-level managers and the firm director(s) since it was rarely recorded that decisions to progress an innovation were taken on by an individual or a manager in isolation. While this does occur and is described in more detail below, collective selection of innovations is more common since fifteen references were made to this strategy across five of the seven case studies.

Evident across all seven cases is that the managing director makes the final decision on what innovation to progress irrespective of product, process, position, and/or paradigm innovations. Fourteen references were made to the managing director's authority when deciding the types of innovations to progress.

> *"[redacted] (Manager) would have no problem using a... you know a thickening agent or a concentrated juice or something that we [Directors] would have always kind of ruled out and [redacted] (the second Director] would be the police[person] there and [redacted][they] would*

say 'no we're not using that, we're not using this, we're not using the other thing' " - Firm A: Director.

The impact of the director(s) on the selection of innovations is clear since the director is central to the decision making within the firm. There is no evidence of upper-level managers selecting innovations to progress without getting the input and final say of the firm director.

While it was outlined in the previous section that these firms are becoming less reliant on instinct as a strategy to select innovations, evidence of the director relying on instinct was found among six of the seven firms as fourteen references were made to this type of selection strategy. Directors and upper-level managers claim reliance on instinct for the selection of all types of innovation. However, throughout the analysis of this section, it is clear that these LMT SMEs are becoming less dependent on their instincts. In the context of selecting which product innovation to progress, *Firm E: Director* claimed that they make decisions:

"By instinct really but... or has been up to maybe two years ago. We now have two people working in marketing and they would identify it. So it has switched around from having us, my husband and myself, [Directors] I suppose talking about an idea and it might very well fall flat on its face. Many of them did. To... I suppose we have a much more expensive premise now than we had before so we can't afford to make mistakes anymore. We could afford to make mistakes when we were small."

Thus, while there was evidence that decisions are still made by relying on instinct, it is less prevalent when it comes to selecting which innovations to progress for some of the case companies.

While upper-level managers were never recorded deciding to select an innovation without the director of the firm first giving their approval, the input from upper-level managers is crucial to the selection process. This is reflected in eleven references to managers input into the selection process across six of the seven case study companies. In the case of all types of innovation, upper-level managers have an input into the selection process.

The scalability of innovations affects the selection of product, process and paradigm innovations. Nine references were made to scalability across five of the seven cases in terms of selecting innovations to progress. Often the challenge for product innovation is not in NPD, but the process of scaling food product production. According to *Firm A: Director.:*

> *"that's a real challenge for lots of guys our size because you can make an absolutely brilliant product on your kitchen table. But how do you replicate that then on a production floor? And that's some bridges we can cross and some of them we can't. We fail because the technology actually costs probably way too much to replicate a person, a human-being making it… so it's a real challenge to maintain product integrity, quality and consistency."*

In terms of the selection of process innovations, the decision can often come down to the type of process that can increase the scale of production. Therefore, the link between product innovations and process innovations are central to the selection of innovations to progress. The issue of scalability also affects paradigm innovation in the case of *Firm B* as the decision to select and implement the specific paradigm innovation is based on the scalability of the manufacturer and whether or not they can supply demand.

The selection of innovations based on the firm's existing capabilities was referenced seven times across three of the seven case studies. These firms displayed a tendency to engage in innovations that were achievable by leveraging the firm's existing capabilities. One of the core reasons this tactic is applied is based on the high cost and therefore high risk associated with building and developing new capabilities. This was evident across all types of innovation, however, it was most common where the case companies relied on external organisations for outsourcing aspects of food production. Firms that select an innovation they don't currently have the capability of implementing require high levels of investment, training and knowledge acquisition. Further, the development of additional capabilities could be a drain of the firm's vital resources, with little certainty of the success of the newly developed capabilities.

The innovation must align with the firm's values, beliefs and preferences if it is to be selected by the firm. This is the case for product, position and paradigm innovations since six references were made to *'firm fit'* among three of the seven case studies. In the case of product innovation, it was outlined by *Firm D: Director:*

> *"Our approach to NPD would be quite unique in that we only really have two factors in the selection of NPD projects. One is that we see [a] market requirement for it. But secondly, projects that we like to develop and make."*

While this isn't an important criterion for the majority of firms, it is fundamental to the selection process of three of the cases since they only select products that are appropriate for a premium market as it aligned with their brand image.

Further, regulation has had an impact on the selection of innovation to progress. Increasingly strict product quality regulations and manufacturing facility standards ensure firms continuously upgrade their processes, forcing firms to engage in process innovation to comply. Evidence of this was presented in three references to product, process and paradigm innovations. According to *Firm B: Director*

> *"This new purpose-built plant... I suppose the department of agriculture, the department of food and the veterinary department keep us on our toes all the time. So we have to... standards keep rising, we have to adhere to them."*

Product regulation was an issue for two of the case studies including *Firm D and B* as they both operate in regulated manufacturing industries.

Lastly, the selection of innovations is driven by a need to differentiate from competitors. This was referenced three times across two of the seven firms as these firms continuously look at ways to differentiate as it is fundamental to their selection criteria for innovations. According to *Firm D: Director:*

> *"To just produce the same as the larger entities we don't think is sustainable. So I suppose the main driver would be the requirement to differentiate ourselves from the market and that would have been the main driver for innovation."*

The desire to differentiate from competitors is also a significant driver for the selection of position innovations. Firms often engage in position innovation due to the identification of a niche market and aim to occupy that space. Table 22 highlights the selection strategies implemented to achieve the different types of innovation engaged in by the case studies.

Table 22: The selection process for the types of Innovation.

Select	Product Innovation	Process Innovation	Position Innovation	Paradigm Innovation
Customer Selection	✓	✗	✓	✗
Market Research	✓	✗	✓	✓
Collectively	✓	✓	✓	✓
Management Input	✓	✓	✓	✓
Instinct	✓	✓	✓	✓
Existing Capability	✓	✗	✗	✗
Scalability	✓	✓	✗	✓
Director Decision	✓	✓	✓	✓
Firm Fit	✓	✗	✓	✓
Regulation	✓	✓	✗	✓
Differentiated	✓	✗	✓	✗

Table 22 reflects the selection methods that exist for product, position and paradigm innovation. All eleven selection methods are implemented for the selection of product innovation, suggesting the selection methods for product innovations are well defined by the firms. This is no surprise since these organisations frequently engage in product innovations. Firms rely on fewer selection methods for process innovations as only six of the eleven selection strategies were implemented. Since process innovation is the most frequently engaged type of innovation, it is clear that these firms depend on fewer selection methods, reflecting their confidence in the selection process as process innovations are typically lower risk. The selection of position innovations depended on nine of the selection strategies outlined in the study. This is due to the close link between position and product innovation as firms typically need to engage in NPD or innovate with existing products to select a position innovation. While only one firm engaged in paradigm innovation, the selection

process relied on nine of the eleven selection methods as paradigm innovations are often quite radical and therefore include a higher level of risk than typically accepted by these firms. Thus, they depend on numerous different selection strategies to increase the likelihood of innovation success.

4.4.3 Implement

The third phase within Tidd and Bessant's Innovation Process Model focuses on the implementation of ideas generated and selected to progress. The implementation phase is the least defined as none of the case studies provided evidence that they dedicate as much time and effort to this phase since there were only seventy-two references made to the implementation processes of innovations. The challenges highlighted throughout the implementation phase is closely linked with the case studies resource constraints and is heavily limited to existing capabilities of the cases. This limits their ability to dedicate an abundance of resources and capabilities when implementing innovations, therefore increasing the difficulty in achieving innovation success. Seven different types of implementation methods were outlined by the case studies and are presented in the following table 23. This is supported by the number of references that were made to the implementation process throughout the data collection process.

Table 23: How Firms Implement Innovations

Implement	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Retailers & Distributors	19	✓	✓	✓	✓	✓	✓	✓
Benchtop Activity	16	✓	✓	✓	✓	✓	✓	✕
Management Capabilities	15	✓	✓	✓	✓	✓	✓	✓
Collaboration	10	✓	✓	✓	✕	✓	✕	✕
Agility	5	✕	✓	✕	✕	✕	✓	✓
Market Data	4	✓	✕	✓	✕	✓	✕	✕
Funding	3	✕	✓	✕	✕	✓	✕	✕

The majority of innovations are implemented applying the first four methods including retailers and distributors, benchtop activity, management capabilities and collaboration. The last three implementation methods are used less frequently and by fewer firms. The following section looks at the types of implementation methods in order of the highest number of references to the lowest.

First, the cases often require the use of retailers and distributors to realise product innovations by bringing them to the market. Since retailers and distributors are the sole routes to market for many of these LMT SME firms, it is crucial that new products are accepted by retailers and distributors. Thus, it is no surprise that nineteen references were made to the dependency on retailers and distributors during the implementation phase across all seven of the case studies. According to *Firm D: Director:*

"What we do is… affording margin to our distributions where it really makes it worth their while for them to sell our products. We don't tie people into minimum orders or annual forecasts. So it's all about flexibility and empathising with your distributor."

While this is evident across all seven cases, *Firm D* is particularly concerned about their relationship with retailers and distributors since they distribute products to seventy countries globally without any designated marketing department and so are heavily reliant on their distributors to make sales on their behalf. This strategy is unique since the attitude among the remaining case studies is quite simple, since they largely view them as a route to market. Additionally, retailers and distributors play a key role in implementing position innovations since failing to leverage central distribution channels would make introducing new products in new markets a challenge.

The firm's benchtop activity is referenced sixteen times across six of the seven case studies and refers to the process of scaling the initial product developed. The process of NPD requires the development of one or a small number of products, usually done in test kitchens. The development of a small number of innovations at this stage is often due to firm resource constraints and difficulty in project management due to firm size. To successfully implement the innovation, the initial product developed must be scaled up which requires transitioning from a small scale production run to large scale production. Throughout this transition phase, the product is tested as the quantities increase to identify any changes in the product taste, quality or texture. At this stage, elements of the production process may have to be changed to maintain the desired product quality and features. This stage of product development is often the most challenging which justifies the application of resources to this phase.

Management capabilities in the context of the implementation phase refer to the capabilities of the management team required to implement the firm's innovations. Fifteen references were made to management capabilities during the implementation phase of the innovation process across all seven cases. While the capabilities of the management team are required for product development, they have been coded to benchtop activity as they fit more appropriately in that section. However, the management capabilities required for the implementation of process innovations predominantly involve engineering capabilities. This is reflected by *Firm D: Director:*

> *"We have brought in quite a team of engineers and now we have 6 full-time fabricators and two full-time electricians that do all our CapEx projects in house and that saves a huge amount in time and efficiencies in terms of... we design and build equipment bespoke to our own requirements which give us efficiencies and reductions in lead times on capital expenditure projects and on expansion projects."*

The capabilities of management in terms of their ability to identify problems in the firm's processes and find solutions to these problems underpins the implementation phase of the firm's innovations. The skills and qualifications of the management team are fundamental to the implementation of innovations.

Also, collaboration is fundamental to the implementation of product, process, position and paradigm innovations. Evidence of this was provided by four of the seven case studies. Ten references were made to collaboration in terms of the implementation of innovations. In terms of product innovation, these LMT SMEs collaborate with other manufacturers to outsource aspects of the production process that is not part of the firm's current manufacturing capabilities. Product

innovation for four of the seven firms required collaborations. Product innovations also facilitate position innovation as NPD provides an opportunity for firms to introduce new products to new markets. The implementation of process innovations also requires external collaboration, evident through improvements in the firm's processes by external entities. Lastly, collaborations also facilitated paradigm innovation for *Firm B*, as they relied on a contract manufacturer in a foreign market to position themselves in that market. This is due to regulations that prevented the production of their products in their domestic market. Without this level of collaboration, the paradigm innovation achieved could not have been implemented.

A dependency on the firm's agility for the implementation of innovations was highlighted by three of the seven case studies. There were five references made to this method of implementation for product and process innovations. According to *Firm G: Manager.*

> *"They [retailer] said there is nobody who can hold a hat to [our] attention to detail. Everybody here knows... get your emails answered within two hours. Move it on. Projects are just moving the whole time."*

The speed of the implementation stage is repeatedly considered a competitive advantage by the firm.

The use of market data was referenced three times across three of the seven cases studies in the context of implementing product innovations. Gathering market data is an attempt to increase the likelihood that the product is accepted by the retailers and therefore launched into the market as not all products developed by the case study companies are accepted by retailers. To overcome

this challenge, the case studies gather market data that provides evidence that the product is likely to succeed if accepted by retailers.

> *"Sometimes the retailers need to be told what the market research is. Because there is no point in keeping it all to yourself." - Firm A: Manager.*

These firms use market data as part of their sales strategy to convince retailers that the product is likely to succeed. This market data typically reflects the size of the market, the competitive landscape, and the product growth potential.

Lastly, three references were made to government funding as a method to implement product and process innovations among two of the seven cases. These firms apply for grants from Enterprise Ireland and other state agencies to identify sources of finance for product and process innovations. Reflecting on all seven cases, these firms are not heavily dependent on government sources of funding as only two of the seven firms engage in this implementation method. Finally, table 24 below highlights the implementation process for the different types of innovation.

Table 24: Implementation methods for the types of Innovation.

Implement	Product Innovation	Process Innovation	Position Innovation	Paradigm Innovation
Retailers & Distributors	✓	✗	✓	✗
Benchtop Activity	✓	✗	✗	✗
Management Capability	✗	✓	✗	✗
Collaboration	✓	✓	✓	✓
Agility	✓	✓	✗	✗
Market Data	✓	✗	✗	✗
State Funding	✓	✗	✓	✗

These LMT SMEs rely on seven different methods to implement any of the four types of innovation. The implementation phase is less defined than any other stage of the innovation process model. The case companies apply six of the seven methods when implementing product innovations. When implementing process innovations, the case studies engage in three of the seven implementation methods, indicating that they continually implement the same methods due to the high success rate of these innovations. This is supported by the fact that they engage in process innovations more often than any other type of innovation. The implementation of position innovations relies on three of the seven methods applied, reflecting the low number of position innovations. Since only one firm provided evidence of engagement with paradigm innovation, only one method reflects the implementation of this innovation.

4.4.4 Capture Value

This phase of the Tidd and Bessant's innovation process model focuses on how the case companies ensure resources invested in the innovation project have been justified based on monetary appraisals or in terms of social value-added. Value is captured through innovation in seven different methods while one hundred and one references were made across all seven cases. This is outlined in table 25 along with the number of references made throughout the data collection process.

Table 25: How Firms Capture Value from Innovations

Capture Value	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Efficiencies	49	✓	✓	✓	✓	✓	✓	✓
Revenue	20	✓	✓	✓	✓	✓	✓	✗
Brand Value	9	✓	✗	✓	✓	✓	✓	✓
Increase Database	7	✗	✗	✗	✗	✗	✓	✗
Consistent Product	6	✓	✓	✗	✗	✓	✗	✓
Extended Shelf Life	5	✓	✗	✗	✗	✗	✗	✓
Building Relationships	5	✓	✗	✗	✓	✗	✓	✗

The majority of value captured from innovations was through an increase in operational efficiency and an increase in firm revenue. Only *Firm F* was an exception since due to their unique customer base, they engage in product innovation that aims to capture value by generating a database of products, further described in this section.

First, the most frequently captured value from innovation activity was to increase the firm's production process efficiency. Forty-nine references were made to efficiencies as desirable outcomes from innovation activity across all seven case studies. This was only evident through process innovations, which is no surprise since process innovation is the most common innovation activity engaged in by the case companies.

> *"We invested quite a bit only last year in new filling machinery… We went from machinery that [fills] 30 units per minute to 150 units per minute. So it basically quadrupled the efficiency of the product coming off it. So that's... it's all about technology and you know investing capital to get more efficient machines that will pump more volume per minute."*
>
> *- Firm A: Director.*

Since these SMEs are competing with larger firms with much greater capabilities in terms of speed of production, this efficiency is highly desirable among these firms.

The second type of value most commonly sought is to increase the overall turnover generated. This was evident in twenty references among six of the seven cases. In terms of product innovation, the general rule applied by each of the seven companies is to achieve a 40% gross margin return from NPD. An increase in turnover is also sought from position innovations through e-commerce platforms that enable the introduction of new products to new customers. Lastly, the incentive to engage in paradigm innovation for *Firm B* relates to the need to continue to grow and increase revenue.

The third most common source of value captured from innovations among LMT SMEs is reputational value through firm brand, referring to an improved reputation among stakeholders. Nine references were made to the firm's reputation across six of the seven case studies. Developing the firm's brand creates a wide range of opportunities such as the improved prospects for position innovation. According to *Firm F: Manager:*

> *"Basically what we are doing is we are putting it out there [developing our own brands], it's sitting on the shelf, it's [selling] well. Retailers come along... 'I want a bit of this."*.

By consistently improving the firm's reputation and the value of the organisations brand, these LMT SMEs aim to capture value in the long run. By consistently engaging in all types of innovation, the value and reputation of the brand will continue to build and provide opportunities to increase growth through increased brand awareness and increase sales.

Additionally, *Firm F* is an exception as they engage in a higher level of NPD due to demands from their unique customer base, as explained in the product innovation section. Seven references were made to increase their product database as the desired result from product innovations. This high level of product innovation also provides a major opportunity for *Firm F* to launch the same product in a new market by targeting industrial, butchery, foodservice and retail customers. The increase in the product database provides the opportunity to give customers a choice but also to keep their customers ahead of their competitors.

Product consistency was referenced six times among four of the case studies as a valuable and desirable output of innovation activity. Improved product consistency is often captured by innovations in the firm's processes. This desire for product consistency is reflected in the statement by *Firm A - Manager:*

> *" 'Oh, what is the [redacted] [product] like this morning? It's thin. What is it like this morning? It's thick.' We are now at a point where… the extras are thicker but consistently thicker. The flavour is consistent."*

Product consistency can be a major competitive advantage for LMT SMEs since it is widely regarded that product consistency is a fundamental requirement for retailers. Thus, it is no surprise that these firms engage most frequently with process innovations. Further, consistency in the food sector builds trust with customers and improves the value of the organisation's brand and is therefore highly valued.

The limited life expectancy of certain products forces two of the seven case study companies to innovate to extend the shelf life of their products. To achieve this, these firms engage in process innovations. According to *Firm A: Director.:*

> *"You do it through innovation, but mostly innovation in processes. So it's extending your shelf-life through closed line technology" - Firm A: Director.*

The value captured from this process innovation is reflected in increased access to export markets which provide the opportunity to increase revenue. However, this is also driven by the retailers and end customers as they often look for longer shelf life, depending on the product quality implications.

Lastly, engagement in innovation is often driven by the desire to build better or more substantial relationships between the firm and its stakeholders. This is evident from five references across three of the seven case studies. In terms of product innovation, some firms have developed new products to further develop the relationship with existing customers. The value captured in terms of process innovations is also aimed at improving and building relations with stakeholders. According to *Firm A: Manager:*

> *"[changing an element of the production process] also gave a substantial amount of extra hours to certain personnel on-site… So you know, there was a double benefit there."*

Table 26 below highlights the value captured by the different types of innovation engaged in by the case studies.

Table 26: How firms capture value from the different types of Innovation

Capture Value	Product Innovation	Process Innovation	Position Innovation	Paradigm Innovation
Efficiencies	✗	✓	✗	✗
Revenue	✓	✗	✓	✓
Brand Value	✓	✗	✓	✗
Increase Database	✓	✗	✗	✗
Consistent Product	✓	✓	✗	✗
Extended Shelf Life	✓	✓	✗	✗
Building Relationships	✓	✓	✓	✗

LMT SMEs look to capture value through seven different methods from each of the four types of innovation. The value captured from product innovations is clearly defined as six of the seven methods are captured through product innovations. This is expected since these organisations frequently engage in product innovation. In terms of process innovation, value is captured across four of the methods outlined. Since process innovation is the most frequently engaged type of innovation, it is understood that these firms are quite clear in the value they look to capture. The value captured from position innovations is reflected in three of the seven methods outlined in Table 26. This is reflected in the lower engagement by these LMT SMEs in position innovations. Lastly, since only one firm provided evidence of paradigm innovation, only one of the seven types of value is captured. This is considered to be the case as paradigm innovations are high risk and challenging to implement. Thus, they are avoided by these LMT SMEs for the most part.

4.4.5 Cross Case Analysis - Innovation Process Model.

In our cross-case analysis, we examine the innovation process model across all seven cases through the dichotomies of *'high growth vs low growth'* and *'family vs non-family'* firms. Our findings suggest that within the LMT SMEs context, high growth firms engage in greater levels of R&D (less than 3% of turnover) than low growth firms. Thus, since innovation output from R&D is widely considered to be more radical than non-R&D innovations, it is no surprise that high growth firms engage in greater levels of R&D than low growth firms.

During the selection phase, our findings highlight how low growth LMT SMEs tend to select innovations by relying on the managing director's intuition. Alternatively, while high growth firms rely heavily on the managing director, they often exhibit greater focus on selecting scalable innovations, perhaps due to a greater focus on international markets.

In terms of implementing innovations, while high growth LMT SMEs procedures tend to be implicit and unstructured, our findings highlight their adoption of greater levels of structure and bureaucracy by hiring educated and experienced management teams as they scale to support the ad hoc approach to innovation management, underpinned by the firm's entrepreneurial orientation.

In terms of capturing value from innovations, high growth firms focus on increasing their market share by launching products in additional markets, which if successful can provide a significant rate of return. Alternatively, low growth firms tend to focus on value such as extending their shelf life and improving product consistency, both of which provide incremental rates of return from the innovation output.

Our findings suggest there is no distinction between the search methods of family and non-family firms. The selection of innovations among LMT SME family firms tends to involve greater influence from the managing director, highlighting the entrepreneurial orientation of these firms. No distinction between the implementation of innovations among family and non-family firms is evident across all seven cases. Lastly, our findings suggest that in terms of capturing value from innovation output, family firms tend to engage in innovations that expose the firm to a lower degree of risk. This is the case as family firms tend to focus on ensuring firm longevity while non-family firms are more willing to engage in innovation activity that involves higher degrees of risk, yet provides a greater return.

4.5 Capabilities

Now that we have addressed research question one and two, we turn our attention to the third research question that seeks to understand "*What capabilities underpin LMT SMEs ability to innovate to facilitate survival and growth?"*. We explore this research question through a set of propositions that compare the themes synopsised from the literature review presented in chapter two. Four common capabilities were identified across all seven case companies including collaboration capabilities, marketing orientation and understanding, entrepreneurial orientation and learning capabilities. While the majority of case studies all have similar capabilities, differences in the nuances of these capabilities exist. Thus, a secondary level of coding was required to get a thorough understanding of the firm's capabilities.

4.5.1 Collaboration Capability

The collaboration capabilities of LMT SMEs refer to the process of two or more individuals working in cooperation, both internally or externally, to achieve a mutual objective. Our findings support proposition one: *"Collaboration supports LMT SME innovation capability"*. The firm's ability to collaborate is the most frequently referenced capability *(Three hundred and twelve references)* across all seven cases. Our findings highlight how LMT SMEs collaborative capability supports all innovation activity. However, these firms demonstrate a preference to initially exploit internal resources before harnessing external resources and capabilities (reflected in the ERBV). LMT SMEs collaborative capability is separated into three subsections that include external collaboration, teamwork and government collaboration, see table 27. External collaboration and government collaboration have been separated due to the high reference count made to government agencies.

Table 27: Collaborative capabilities

Collaborative Capabilities	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Ext. Collaboration	157	✓	✓	✓	✓	✓	✓	✓
Teamwork	116	✓	✓	✓	✓	✓	✓	✓
Gov. Collaboration	44	✓	✓	✓	✓	✓	✓	✓

The ability to collaborate, externally, within teams and with government agencies is central to innovation activity across all seven cases. The following table reflects the link between the firm capability and its effect on Tidd and Bessnat's Four P's of Innovation Space and their Innovation Process Model.

Table 28: Link capability to the innovation type and innovation process model.

Capability	Collaboration	Ext. Collaboration	Teamwork	Gov. Collaboration
Type of Innovation	Product	✓	✓	✓
	Process	✓	✓	✓
	Position	✓	✓	✓
	Paradigm	✓	✓	✗
Innovation Process	Search	✓	✓	✓
	Select	✓	✓	✗
	Implement	✓	✓	✗
	Capture Value	✗	✗	✗

External collaboration capabilities refer to the firm's ability to cooperate with entities and individuals external to the organisation, with the exception being government agencies which are discussed separately. Throughout the data collection phase, one hundred and fifty-six references were made to external collaboration, emphasising its importance for innovation across all case studies. According to *Firm C: Director:*

> *"Of our new products in the last 3 or 4 years, everything has had a local aspect… [in] the* [redacted] *(condiment product A), we're using* [redacted] *(brewery A) that is from* [redacted] *(county A). And our pasta sauces, all the* [redacted] *(meat product) is coming from a* [redacted] *(local business). We have a new…* [redacted] *(condiment B) [that] is from a lovely small* [redacted] *(brewery B) in* [redacted] *(county B)."*

External collaborations are regularly achieved through cooperation with consultants, suppliers, retailers, distributors, and end-customers in terms of searching for, selecting and implementing

innovations. It is suggested that the resource and capability constraints of the case companies influence the development and maintenance of these collaborative capabilities to compensate for their resource constraint. Thus, these case studies attempt to share resources to reduce their resource constraints and reduce the risk of an innovation failing by working with entities that have experience and expertise with certain innovations. It is also often cheaper for these cases to outsource an element of the production or even a service to a firm in their network rather than develop the capabilities to implement the innovation themselves. Collaboration among peer LMT SMEs in the food sector occurs weekly and influences the firm's type of innovation activity as well as the innovation process model, particularly when searching for innovations since the problems experienced by peer LMT SMEs are often similar. Once a problem is solved for one LMT SME, the information is shared within the network of firms and ideas are regularly exchanged.

Teamwork refers to the collaborations of individuals within the firm and was referenced one hundred and seventeen times across all seven cases. The ability to work in teams is common across all case companies included in this study and supports their ability to innovate across all types of innovation as well as the innovation process model. Tightly knit communities of employees working collectively with clear, precise and effective internal communication was reflected not just among managers and lower-level staff but also directors since no manager or director decided in isolation. While individuals are given the discretion to carry out their role as they see fit, no individual is acting without prior internal consultation.

Government collaboration refers to the cases ability to utilise government resources and state agencies such as Bord Bia, Enterprise Ireland and Bord Iascaigh Mhara (supports the Irish seafood industry) to innovate. This capability was evident when searching for product, process and position innovations and was referenced forty-four instances, highlighting how the initiatives set out by some governments agencies align closely with the intentions of the case studies. In particular, Bord Bia's Origin Green was held in high esteem. However, little evidence of collaboration with other state agencies is highlighted. Agencies such as Enterprise Ireland were sporadically referenced when engaging in R&D, yet no firm outlined any significant reliance on this agency. It is suggested that the collaborations among these cases tend to be informal and are often in the form of non-equity collaborations with suppliers (as purchasers of HT products), consultants, and customers rather than with research centres and government bodies since the case companies do not have sufficient resources to continuously engage in the STI mode of innovation.

4.5.2 Marketing Orientation and Understanding

Marketing orientation refers to an organisation's ability to anticipate the needs of future customers through effective knowledge acquisition and utilise this knowledge to improve marketing planning, investment and implementation (Vorhies et al., 2009; Wu, 2013). Our findings support proposition two: *"Marketing ability supports LMT SME innovation capability"*, since one hundred and fifty-nine references were made to marketing orientation across five of the seven cases. Our findings suggest that the case companies marketing orientation is a firm centric (internally controlled) capability that plays a key role in how LMT SMEs innovate for survival and growth.

The cases under investigation emphasise innovative and creative ways of marketing that don't require high levels of finance, due to the limited capital available to LMT SMEs. The perception of marketing among LMT SMEs is characterised by high risk and so the majority of firm directors tend to be cautious in terms of marketing.

> *"Marketing for me is to spend without being able to measure how it has worked or not. I love to buy a machine because I can see that machine and I can see it producing [the] product. In marketing, you could invest a million quid and you wouldn't know if you reached your consumer or not." - Firm A: Director.*

This not only reflects the process orientation of LMT SMEs but also their attitude and shifting reliance from a few key individual's instincts to a greater dependence on data when making decisions. Table 29 reflects the subsections of the firm's marketing orientation.

Table 29: Marketing Orientation

Marketing Orientation	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Customer Focus	65	✓	✓	✓	✓	✓	✓	✓
Marketing Strategy	50	✓	✓	✓	✓	✓	✓	✓
Trade Shows	26	✓	✓	✓	✓	✓	✗	✗
Trad. Marketing	23	✓	✓	✓	✗	✓	✗	✓
Digital Marketing	22	✓	✓	✓	✗	✓	✗	✗
Market Research	7	✓	✓	✓	✓	✓	✓	✓

Marketing orientation of LMT SMEs is central to the innovation efforts of all seven case companies included in this study. Table 30 highlights the link between the marketing orientation

of the firm and its effect on the type of innovation engaged in by the case companies and the innovation process model.

Table 30: Link capability to the innovation type and innovation process model.

Capability	Marketing	Customer Focus	Marketing Strategy	Digital Marketing	Market Research	Trade Shows	Trad. Marketing
Type of Innovation	Product	✓	✓	✓	✓	✓	✓
	Process	✗	✗	✗	✓	✓	✗
	Position	✓	✓	✓	✓	✓	✓
	Paradigm	✓	✓	✓	✓	✗	✓
Innovation Process	Search	✓	✗	✗	✓	✓	✗
	Select	✓	✗	✗	✓	✗	✗
	Implement	✓	✗	✓	✓	✗	✓
	Capture Value	✗	✗	✗	✗	✗	✗

Strong customer focus is the most frequently referenced marketing orientation *(sixty references)* among the case studies and is considered one of the main capabilities of LMT SMEs. The case companies included in this study are all close to their customers, keeping many touchpoints with them to continuously identify and understand their needs.

> *"We're meeting people all the time. So it's not research but it is kind of research, it's unofficial research. People are telling us what they like, what they don't like, what they would love to see us doing if they have any issues with any of the packaging. So then we can come home and improve it." - Director C.*

This strong customer focus plays a significant role in the types of innovation that LMT SMEs engage in such as product, position and paradigm innovation and also the process by which they

manage activity when searching, selecting and implementing innovations. A core objective common among the case studies is to continuously seek feedback from customers to ensure they understand their requirements, something that is understood to increase the likelihood of innovation success and therefore mitigate the risk of an innovation project failing. The innovation management of these case companies requires consistent responses to ever-changing consumer requirements. Thus, these cases are in constant communication with a variety of stakeholders, perhaps due to the lack of investment in R&D and the STI mode of innovation.

The marketing strategies of LMT SMEs refer to plans of action that aim to increase firm sales. Fifty references were made to marketing strategies throughout the data collection phase. This is no surprise due to the focus on building and developing LMT SME marketing capabilities. The case companies' expenditure on marketing ranges between 1% and 5% of revenue. According to *Firm B: Manager:*

> *"We are definitely spending over [€] 500,000 and that is based on a turnover of [€]17 million and I'd say it could be more."*

According to the data collected from the case study companies, the average budget contributed to marketing strategies is approximately three per cent of overall revenue. However, this per annum spend is increasing across all seven cases.

Additionally, trade shows are an important source of innovative ideas among five of the seven case study companies. Twenty-six references were made to trade shows during the data collection phase. These trade shows are based both nationally and internationally and are central to the search

for product, process and position innovations as they gather large amounts of customer feedback that highlight areas that need improving but also identify new ideas.

> *"We don't employ big market research companies or anything. We talk to people and we talk to our own customers and when we go out to shows... and as I said now we will be talking to thousands of people, talking to thousands of people at the ploughing [championship] in mid-September and we would very much take on board what people say." - Firm B: Director*

Additional to the value gathered by engaging with customers, trade shows increase brand awareness and provide the opportunity to meet with distributors, potentially increasing the number of routes to market.

Traditional advertising such as radio and TV advertising is considered important to product, position and paradigm innovation and was referenced twenty-five times. The application of these resources underpins the implementation phase of the innovation process model. While traditional marketing is still frequently used, it is clear that digital and social media marketing is becoming increasingly popular. While the number of references for digital marketing (twenty-two) was lower than traditional marketing, the level of engagement in digital marketing appears to be increasing per annum. All case companies outlined an intention to increase their expenditure on digital marketing by engaging with social media advertising, food bloggers, social media influencers, and the digital marketing of retail customers. Many of the case companies propose to hire digital and social media marketing teams to support the implementation of product, position and paradigm innovations. Interestingly, two of the three high growth firms (Firm D and G) didn't engage in digital marketing to any degree, in part due to limited resources such as owners and managers time,

limited budgets and the lack of understanding in how to build a successful digital marketing campaign.

The market research capabilities of these firms involve in-depth studies on new and existing customers. This is distinct from R&D as the analysis is confined to elements of the market such as the size of the target market and its customer's characteristics. Seven references were made to market research when engaging in all types of innovation activities as it is increasingly common when searching for, selecting and implementing innovations. The importance of the case studies marketing orientation is reflected in its influence over other LMT SME capabilities since they directly impact an organization's ability to absorb information and knowledge external to the firm (Su et al., 2013). Thus these capabilities were found to have an impact on the other innovation capabilities developed by the case studies.

4.5.3 Entrepreneurial Orientation

Our findings support the third proposition: *"Entrepreneurial orientation supports LMT SME innovation capability"*, since firm directors and management's ability to lead, inspire and guide the organisation is common across all seven cases as one hundred and sixteen references were made to the entrepreneurial orientation of directors and upper-level managers. The entrepreneurial orientation of these case companies is at the heart of their innovation capability, something that is considered firm centric (internally controlled), underpinned by years of experience and insights. Table 31 distinguishes between the directors and the upper-level manager's entrepreneurial capabilities.

Table 31: Entrepreneurial Orientation

Entrepreneurial Orientation	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Director	84	✓	✓	✓	✓	✓	✓	✓
Management	39	✓	✓	✓	✓	✓	✓	✓

The directors and management's ability to lead the organisation is common across all seven case studies and is viewed by the respondents as being essential to the firm's innovation efforts.

Table 32: Link capability to the innovation type and innovation process model.

Capability	Entrepreneurial Orientation	Director's Leadership	Management's Leadership
Type of Innovation	Product	✓	✓
	Process	✓	✓
	Position	✓	✓
	Paradigm	✓	✓
Innovation Process	Search	✓	✓
	Select	✓	✓
	Implement	✓	✓
	Capture Value	✓	✓

Managing directors of LMT SMEs are central to innovation activity and often responsible for the decision making required during innovation management, reflected in sixty-five references across the seven cases. According to *Firm D: Manager:*

> *"The* [redacted] *(Director's) background is the driving force behind the company you know. The driving force in terms of innovation and process and making sure the process is effective and efficient and produces the best results."*

Our findings highlight how all founders of each of the seven cases are also the managing director(s) of the organisations. Therefore, they often lead by demonstrating huge commitment and dedication through hard work and long working hours. Their centrality is undeniable as little to no decision, particularly related to innovation is made without the consultation of the firm director. The following table reflects the firm director's experience and formal education.

Table 33: Director's Experience and Formal Education

Director	**Transcript References**	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Director Experience	39	✓	✓	✓	✓	✓	✓	✓
Director 1 - Formal Education	3	✗	✗	✗	✓	✗	✓	✗
Director 2 - Formal Education	8	✓	***N/A***	✓	✗	✗	✓	✓

The director's experience is cited *(forty-two references)* as a key characteristic that underpins the innovation efforts of LMT SMEs. Each director within the case studies has significant experience in their respective industries, gained in either large corporations, self-employment and/or family businesses where they have learned and continued to grow their capabilities. Analysis of the seven case studies found that only two of the seven firm's primary directors are formally educated at 3rd level. However, since six of the seven firms are partnerships and have two or more directors, those directors without formal education are supported by a director with a formal 3rd level education. Additionally, since many of the primary directors aren't formally educated, this could explain the reason behind hiring formally educated and experienced upper-level managers to support the decision making of the directors.

This leads us to our finding that the upper-level managers of LMT SMEs also have an entrepreneurial orientation that underpins innovation efforts. Thirty-five references were made to their entrepreneurial capabilities across all four types of innovation. According to *Firm A: Director:*

> *"[redacted] (NPD Manager) challenges us to go down the route of you know talking [redacted] (new ingredients) and actually starting to talk about those subjects on [the] pack. And that's kind of a little bit of a struggle that's going on at the moment between us. You see, he's pulling us down that route because he can see [a] huge opportunity and we're kind of pulling back because we're saying that's not currently the way we have done things. But that's not to say that we're not open to change either." - Firm A: Director.*

While the director gets the final say on what decisions are made within the firm, the upper-level managers are crucial to the innovation efforts of LMT SMEs by debating and challenging the existing way of doing things and the existing perspectives of directors. Additionally, upper-level managers reduce the resource constraints that exist within the firm through their knowledge and expertise based on their experience and education, reflected in Table 34.

Table 34: Upper-Level Managers Experience and Education.

Management	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
Experience	65	✓	✓	✓	✓	✓	✓	✓
Formal Education	28	✓	✓	✓	✓	✓	✓	✓

The experience of the management team is cited *(sixty-five references)* as a key characteristic that underpins the innovation efforts of the case studies. All directors and managers within LMT SMEs have significant experience in their respective industries. According to *Firm F: Director:*

"I would have 30 years' experience... [redacted] (Plant manager) would have 25 years' experience... [redacted] (second director) would have close to 40 years' experience... [and] [redacted] our quality manager has 10 -15 years in the game."

A common characteristic across all seven case studies is the highly experienced management teams. LMT SME directors hire managers with existing capabilities that ensure they make an impact on the firm. Therefore, many of the upper-level managers in these firms have years of industry-specific experience working with large multinationals and corporations. The formal education of upper-level managers is also considered significant to the innovation capabilities of LMT SMEs as twenty-eight references were made to formal education across all seven case studies. Analysis across the seven case studies showed that all upper-level managers are formally educated at 3rd level. Thus, it is clear that the directors of these LMT SMEs are motivated to hire educated and experienced individuals. These educated and experienced teams complement the entrepreneurial orientation of LMT SMEs by addressing some of their knowledge blind spots. Furthermore, our findings suggest that as LMT SMEs scale, the entrepreneurial orientation of the firm is diluted due to the requirement for greater due diligence to maintain control and direction. While this creates a tradeoff between the entrepreneurial drive of the firm and formalised system, it supports a greater scale of innovation activity.

4.5.4 Learning Capability - DUI Mode of Innovation.

The findings support the fourth proposition: *"Learning capacity supports LMT SME innovation capability"*. The learning capabilities of LMT SMEs are defined by the DUI mode of innovation. The importance of learning capabilities is reflected in the eighty-two references recorded throughout the data collection procedure. This DUI mode of innovation is at the heart of LMT

SME innovation capability, something firm centric (internally controlled), underpinned by a trial and error approach to innovation that aligns with entrepreneurial orientation of the firm and the resource constraints that make STI learning out of reach of SMEs in terms of financial and investment time limitations. Fourteen references were made to DUI learning capabilities across all seven case studies. While there are sixty-eight references to the STI mode of innovation, which may at an initial glance suggest that LMT SMEs emphasise greater engagement in this learning capability, this reference count is only higher since the case companies were asked about their R&D activity during the data collection phase to identify the level of expenditure on R&D activities. This is the case since innovation management research has largely focused on R&D as the main determinant of innovation performance (Heidenreich 2009; Som, 2012 Hirsch-Kreinsen, 2015; Love and Roper, 2015; Dooley and O'Sullivan, 2018). This is reflected in table 35.

Table 35: Learning Capabilities

Learning Capabilities	Transcript References	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
DUI	14	✓	✓	✓	✓	✓	✓	✓
STI	68	✓	✗	✓	✓	✓	✓	✓

The DUI mode of innovation influenced all seven case studies across all types of innovation and also the search, selection and implementation of innovations.

Table 36: Link capability to the innovation type and innovation process model.

Capability	Learning Capabilities	Doing, Using and Interacting	Science, Technology and Innovation
Type of Innovation	Product	✓	✓
	Process	✓	✓
	Position	✓	✓
	Paradigm	✓	✗
Innovation Process	Search	✓	✓
	Select	✓	✗
	Implement	✓	✓
	Capture Value	✗	✗

Our findings suggest that the case studies predominantly depend on a DUI mode of innovation, characterised by incremental problem solving utilising practical knowledge and experience that provides incremental learning for these LMT SMEs. According to *Firm A: Manager:*

> *"NPD needs to understand the maximum potential capacity of the process. If they don't know how to operate the machine, they need to figure it out. They need to know that, 'oh yeah if you turn that up it goes soft... if you turn it down it goes hard. Oh, that is interesting. Now I have an idea of how I can put it [the product] into a different pack.'"*

The DUI mode of innovation is supported through the purchase of HT products from HT firms such as advanced machinery and equipment that enables firms to engage in a trial and error approach that reflects doing, using and interacting to improve efficiency and productivity, vital for innovation sustainability.

The DUI mode of innovation is reflected in the engineering capabilities and entrepreneurial orientation of these cases as some of the case companies hire individuals or teams of engineers to build bespoke solutions to unique manufacturing and production problems. Since the cost of purchasing HT machinery is so high, these firms build the equipment and machinery necessary for production due to the cheaper cost. These firms also purchase second-hand machinery as a method of overcoming this problem, often providing a competitive advantage over larger entities as they are so knowledgeable in the production process. The knowledge exchange underpinning learning and subsequent innovation are heavily relational based and embedded in the existing supply chain. Thus, the intricate understanding of the production process underpins the consistent incremental process innovation improvements continually made by those most familiar with the production process. According to *Firm D: Manager:*

> *"[the packaging] was a manual process where we had to stick a pump into the* [redacted] *(equipment) to pump out the* [redacted] *(product) one* [redacted] *(equipment) at a time. So the guys in the fabrication team and fitting team created a piece of equipment to do these things six at a time and speed up the whole process and bar a few teething errors initially, it has been [a] huge success. It has sped up the whole process."*

Since LMT SMEs engage most often in process innovation, it is no surprise that these firms develop these capabilities to continually work on improving the firm's manufacturing process. The cost savings often realised by developing bespoke equipment bring about major efficiencies for the firm while also ensuring the specific requirements of the firms are satisfied.

The case studies rarely engage in the STI mode of innovation as resource constraints make STI learning out of reach of SMEs in terms of financial and investment time limitations. Further, the

long timelines typically required to commit to an R&D project makes the process too expensive and too unpredictable, due to the changing needs of customers, particularly in the food sector which is characterised by high degrees of change due to ever-changing trends. Additionally, LMT SMEs have a limited pool of resources that can be diverted to long term goals. If the resources required from directors and upper-level managers are invested in long term objectives, it could lead to an immediate negative impact on the other business operations. These resource constraints, therefore, make R&D projects unfeasible.

Our findings highlight how the case studies expenditure on R&D ranges between one and twelve per cent of revenue. However, due to the frequent inclusion of market research expenditure being added to R&D expenditure throughout some of the interviews, the average is considered to be approximately 3% of revenue. This indicates that while all exist in the low-tech industry, some firms are HT within this low tech classification. The range of expenditure on R&D according to the case studies is reflected in table 37.

Table 37: Range of expenditure on Research and Development

Capabilities	Firm A	Firm B	Firm C	Firm D	Firm E	Firm F	Firm G
R&D Capability	1%	N/A	3.9%	N/D	12%	10-12%	N/D

Reflecting on the seven case studies, two of the firms were not aware of the level of expenditure on R&D, yet both firms provided evidence of low levels of engagement in R&D. Further, *Director A's* perspective on R&D highlights the lack of clarity between R&D, market research and product development.

"Yes at one stage we did [engage in an R&D project] ... but we found that there was actually a lot of paperwork involved to get the amount of credit that we received back from it and I think also we just weren't 100% comfortable that what we were doing was actually you know research and development. It was more product development... existing product development." - Firm A: Director.

In the rare circumstance that the case companies did engage in R&D, it was often through collaborations with research centres, universities and government bodies. This was based on incentives that include funding provided by government agencies such as Enterprise Ireland. While the costs of an R&D project are particularly challenging for LMT SMEs, R&D grants can provide sufficient incentive to justify the cost and the risk associated. R&D can also provide a competitive advantage for LMT SMEs by supporting the development of products and processes that can be patented.

4.5.5 Cross case Analysis - Capabilities

In our cross-case analysis, we examine the dichotomies of '*high growth vs low growth'* and '*family vs non-family*' firms. Our findings highlight little differences in the capabilities that underpin the different dichotomies innovation activity. No distinction between the collaborative capabilities of either of the dichotomies exist across all seven cases. Additionally, across all seven cases, there seem to be similar marketing capabilities evident. However, high growth firms do tend to have greater levels of expenditure on marketing activities, by hiring marketing teams and dedicating greater resources to this department. Low growth firms tend to be cautious in terms of marketing spend, as they often have difficulty measuring the success of their marketing activities and tend to prefer to spend in areas where measuring the return on investment is more accurate such as

purchasing machinery to increase production. Additionally, our findings suggest that as firms grow, the entrepreneurial orientation of the firm is diluted. Thus, high growth LMT SMEs are not as dependent as low growth firms on the entrepreneur for survival and growth. Reflecting on the second dichotomy, no distinction was evident between the capabilities of family vs non-family firms.

4.6 Concluding Remarks.

In conclusion, our findings outline firstly, how LMT SMEs in the food sector do innovate. Secondly, their innovation activity is predominantly concentrated on process innovation, while product (including packaging) and position innovation are secondary in terms of resources allocation. Little to no evidence of paradigm innovation was recorded during the data collection process. Further, across all types of innovation, incremental innovation nature is evident, perhaps due to resource constraints, risk-averse attitude attitudes, and a fear of losing the venture. However, a symbiotic relationship exists between the different types of innovation engaged in by the case companies. A close alignment between product, process and position innovation is evident since one type of innovation is often a consequence of innovating in other areas.

The innovation process of LMT SMEs is predominantly characterised by a culture of informal, unstructured and reactive decision-making processes. This culture has developed since LMT SMEs are reactive rather than proactive when managing innovation by responding to market demands rather than exploiting emerging trends (Terziovski, 2010; Hirsch-Kreinsen, 2015; Tidd and Bessant, 2018). While this responsiveness is central to the competitive advantage of LMT SMEs, it is more widely considered a weakness (Som, 2012). Thus, our findings suggest that as

LMT SMEs continue to survive and grow, they develop more structure with formalized routines and practices when managing the innovation process by hiring managers that bring increased levels of professionalism as the dependence on the entrepreneurial leader recedes (Greiner, 1989). Thus, as SMEs grow, there is an underlying tension between the agility of the entrepreneur and the development of processes and routines that must be synthesized to aid the innovation process.

Lastly, the capabilities underpinning the innovation activity of LMT SMEs that facilitates survival and growth include collaboration capabilities, entrepreneurial orientation, market orientation and a DUI mode of innovation. LMT SMEs depend on collaborative capabilities to leverage the resources and capabilities of firms within their network. The market orientation of LMT SMEs is central to underpin LMT SMEs innovation activity as these firms rely on this capability to remain customer-focused and in touch with market requirements (Hirsch-Kreinsen, 2004; Tunzelmann and Acha, 2005; Hirsch-Kreinsen, 2008; Heidenreich, 2009). The entrepreneurial orientation, in particular in the LMT SME context, is vital to the innovation trajectory of the firm based on their tacit knowledge and centrality in terms of implicit strategic orientation. Lastly, the DUI mode of innovation is central to innovation activity as it relies on tacit knowledge that is often characterised by incremental problem-solving. For a graphical representation summarising the key findings, see table 38 below.

Table 38: Summary of Key Findings

RQ	Model and Proposition Test	Key Findings
RQ 1.	Tidd and Bessant 4 Ps of Innovation.	LMT SMEs do innovate for survival and growth.
		LMT SMEs innovation output is primarily incremental, with little evidence of radical innovation across the innovation types of the cases studied.
		Process Innovation is the predominant type of innovation undertaken within LMT SMEs, both in terms of quantity and strategic importance for the firm, followed by regular product innovation. While product innovation contributes by increasing market share and potential profit margin, process innovation not only reduces the SMEs cost base to counteract the advantages of economies of scale of larger firms but also provides new manufacturing capability that drives future product innovation.
		LMT SMEs do show evidence of engagement in position innovation, primarily with an internationalisation focus. However, little to no paradigm innovation was evident in the SME cases studies.
		LMT SMEs innovation activity is an ongoing and dynamic phenomenon, not only contributing to LMT SMEs continued survival and growth in the face of global challenges but also to the health of the regional economy.
		The incremental nature of innovation undertaken by LMT SMEs highlights that the STI mode of innovation (R&D) source of innovation is low. Primarily LMT SME innovations are existing technology adoptions (e.g. process innovation). While these firms have low engagement in breakthrough R&D as an innovation source, their creativity, entrepreneurial orientation and market responsiveness ensures a rich pipeline of innovations for sustainability and competitiveness.

RQ	Model and Proposition Test	Key Findings
RQ 2.	Tidd and Bessant Innovation Process Model.	While management of the Innovation Process is evident in all cases studied, its nature is often implicit and ad hoc, centralised within several key individuals (e.g. entrepreneurial MD). Consequently, interventions in the Innovation Process are often ad hoc in response to a crisis or the stimulus of opportunity recognition. The innovation Search phase is highly proactive driven by entrepreneurial opportunity recognition. However, other phases of the process such as Implementation exhibit more reactive decision making evolving as part of 'trial and error'.
		The resource-constrained nature of LMT SMEs, resource availability (financial, knowledge and capability) limits both the scope and scale of innovations accessible to the firm. The timeline for the majority of innovation return is understandably short (1-2 years) and something which aligns with the incremental innovation nature and risk management highlighted in RQ1. A positive of this constrained context is that LMT SMEs instinctively look to external sources when faced with innovation development constraints. However, this leverage of external resources is largely constrained to their existing network, something which may inhibit radical innovation opportunities.
		At the Search phase, LMT SMEs are shown to leverage a wide range of innovation sources, harnessing both internal and external sources to 'feed the pipeline'. The engagement of 'downstream' supply chain stakeholders was highly evident, not only as a source of emerging market trends but also as a channel for market adoption and commercialisation.
		While some of the larger SMEs had a defined strategic plan to nurture explicit alignment as part of a stage-gate process, the strong entrepreneurial orientation of the firm sometimes meant no explicit strategy existed and even when it did, it was sometimes overwritten by the entrepreneurial MD. While this provides the firm with high agility and responsiveness to emerging trends, it can also result in a diverse portfolio of actions and lack of due diligence.
		At the Implementation phase, few explicit routines and practices for systematic management of the innovation development exist. Interventions are heavily project-specific, with the entrepreneurial orientation of the team and the dominant trial and error approach of DUI learning highly evident, resulting in opportunistic pivots as development progressed.

		Given process innovation importance, the value captured from innovation activity primarily involved improving productivity and efficiency in production, contributing to firm survival. However, the value captured from product innovation and position innovation efforts was typically reflected in increased firm turnover, contributing to firm growth.
		As LMT SMEs scale, there is evidence of more structure with formalized routines and practices for innovation management. This may be a consequence of the dilution of the entrepreneurial MD influence or a natural response to increased innovation activity that makes it impossible for one person to maintain oversight.
RQ	Model and Proposition Test	Key Findings
RQ 3.	Collaboration supports LMT SME innovation capability.	Given the resource-constrained nature of LMT SMEs, collaboration is a core capability supporting innovation as LMT SMEs engage with external sources to advance innovation projects. Leverage of external resources tends to be heavily skewed towards informal relationships based on reciprocity/mutual benefit and rarely take the form of equity-sharing collaborations.
		Leverage of external resources is based on the requirements of the specific project context, occurring for both exploratory and exploitative purposes. However, within our sample, activity is heavily skewed towards the frontend of the process (exploratory). LMT SMEs leverage a wide range of collaborative partners such as suppliers (as purchasers of HT equipment), consultants, and customers but the selection is biased towards the supply chain and personal network of the entrepreneur. Given the low leverage of partners in analogous industries or public research institutions, findings indicate significant scope for LMT SMEs to increase the breadth and depth of partner collaborations to support their innovation process.
		Collaboration has both an internal and external focus to support innovation efforts. Integration of employee groups, guided by management teams provides the firm with a high level of creativity, agility and responsiveness to emerging opportunities. This is especially true of process innovation, where tacit knowledge and curiosity of employees is core to the trial and error experimentation that underpins development.

		LMT SMEs collaborative capability supports all innovation activity but firms have a preference to initially exploit internal resources before harnessing external resources and capabilities (reflected in the ERBV). Such practice impacts all phases of the innovation process model but is particularly influenced by the desire to optimise value capture in the commercialisation phase.
RQ 3.	Entrepreneurial orientation supports LMT SME innovation capability.	Findings highlight the entrepreneurial orientation of the MD as core to innovation activity of the SME, both in recognising opportunity potential, creatively overcoming resource impediments and nurturing development. Thus, few decisions are made without the director's approval and their position at the interface between operational capability and market opportunity allows them to alter the nature of their innovation focus. This entrepreneurial orientation is at the heart of LMT SME innovation capability, something firm centric (internally controlled) and underpinned by years of interactions, experience and insights.
		The entrepreneurial orientation of LMT SMEs not only exists in the MD but also key individuals of management teams, given their sense of connection to the company. The dynamic between these is important for innovation activity in debating and challenging the scope for potential innovation.
		While the LMT SMEs MD's education is one of experience rather than formal qualification, they often seek to address this structural hole by hiring more formal/traditionally educated managers to complement their entrepreneurial capability. Our findings suggest that as LMT SMEs scale, the entrepreneurial orientation of the firm is diluted as tradeoffs occur with the need for greater systemisation to maintain control and direction. This can cause tension between entrepreneurial drive and formalised system requirements but it also supports great quantity/scale of innovation activities and increased due diligence.
RQ 3.	Marketing ability supports LMT SME innovation capability.	The lynchpin position of the entrepreneurial MD at the interface between production capability and the emerging market opportunity is at the heart of LMT SME innovation capability.

		Consistent and deep interaction with the customer base by SME not only provides an important channel for communicating the value proposition to the market but also provides a deep insight into future market opportunities and requirements. Resource constraints require LMT SMEs to find creative ways of marketing and market introduction. Often marketing knowledge acquisition occurs through informal channels and leverage of information from within the supply chain partners, equipment producers and trade conferences. From a marketing knowledge dissemination perspective, cost-efficient channels are heavily leveraged, with in-store promotion preferred method. This risk-averse marketing approach results in more organic growth as a consequence of any new product introduction but also ensures that negative reaction of market introduction can be rectified through corrective action agility (DUI learning) and minimise the threat to SME sustainability.
		Marketing orientation, a firm centric (internally controlled) capability, plays a key role in how LMT SMEs product and position innovations, given strong customer/retailer engagement in the search and select phase of the innovation process.
RQ 3.	Learning capacity supports LMT SME innovation capability	The trial and error nature of innovation development in LMT SMEs ensures that learning is a key innovation capability. The dominant learning mode of LMT SMEs is that of DUI, aligning with the entrepreneurial orientation of the firm. Similarly, resource constraints make STI learning out of reach for SMEs in terms of both financial and investment time limitations. The knowledge exchange underpinning learning and subsequent innovation is tacit, heavily relational based and embedded in the existing supply chain. Knowledge acquisition is absorbed by key individuals, blended with entrepreneurial creativity to solve pressing problems and exploit opportunities through ongoing trial and error approach.
		While STI mode of innovation has less relevance for LMT SME innovation, R&D efforts do exist, with specific firms demonstrating a commitment to R&D above the sector level norm by leveraging the R&D efforts of suppliers such as equipment producers as inputs to their efforts. Greater leverage of R&D is primarily within larger-scale SME possessing additional resources to support such initiatives and engagement with public research centres.

5 CHAPTER FIVE - DISCUSSION

5.1 Introduction

Following on from the description of the findings of the empirical research (chapter four), this chapter delves deeper into the findings to explore their alignment with best practice concerning LMT SME innovation activity and enrich the understanding of innovative behaviour and how this important, yet neglected sector of the economy survives and grows in the face of global competition. This discussion follows the structure outlined in the findings chapter and marries findings and theory to illuminate the contribution of the research. The discussion focuses on firstly, on the context of the study and the characteristics that define LMT SMEs. Secondly, this chapter discusses the types of innovation from Tidd and Bessant's Four P's of Innovation Space. Thirdly, the discussion delves into Tidd and Bessant's Innovation Process Model, by which LMT SMEs manage their innovation process. The section concludes by discussing the capabilities that underpin LMT SMEs ability to innovate to facilitate survival and growth.

In explaining the context of the seven LMT SME cases of the food sector, we highlight four of the following issues relative to our research questions. Firstly, we find that SMEs are significantly resource-constrained in terms of capital, human resources, technological knowledge, and equipment (Cohen and Levinthal, 1990; Hirsch-Kreinsin, 2008; Hervas-Oliver et al., 2011; Love and Roper, 2015), something that places a constant limitation on both their innovation activity and ambitions.

The second issue of SME context, associated with the resource-constrained nature, is the centrality of the entrepreneur to the innovation trajectory of the firm. Research by Heidenreich (2009) and Hirsch-Kreinsen (2015) supports our finding by suggesting that LMT SMEs have a high dependency on a few key employees such as the managing director and upper-level managers, in terms of innovation performance, thereby linking with upper echelon theory (Hambrick and Mason, 1984). However, it is suggested by Cohen and Levinthal (1990) that this may impact the firm's absorptive capacity concerning innovation-related knowledge and limit the type of innovation engaged in and the diversity of innovation partners, something that may have ramifications for their adoption of open innovation paradigm. Therefore, the centrality of the entrepreneur(s) / owner(s) of the small firms is considered more influential to the strategic direction of the firm (Mascitelli, 2000; Heidenreich, 2009; Hirsch-Kreinsen, 2015) than in large organisations. Furthermore, LMT SME actions are influenced by gut feeling, intuition and the relative ambitions of the entrepreneur for the future. While this provides LMT SMEs with agility and responsiveness to compete, it also exposes them to potential unforeseen risk due to a lack of or poor due diligence. Thus, an emergent approach to innovation management in LMT SMEs is evident in the research rather than a more positional planned approach.

Thirdly, a common existence of family connections in LMT SMEs is prevalent in the context of this study. Family members running and operating LMT SMEs often have the liberty and independence to make decisions that would be impossible in non-family firms due to decision-making processes in larger firms often being controlled by bureaucratic structures (Carney, 2005). Our findings highlight how a family/regional connection influences firm commitment and their willingness to push through hard times for firm survival and to transition the firm between

generations. This has resulted in firms of significant age possessing deep capabilities that underpin innovation efforts and resonate with the RBV perspective of the firm (Barney, 1991). According to family business scholars (e.g. Cyert and March, 1963; Westhead and Howorth, 2007), family firms have ambitions and objectives separate to simply achieving favourable economic performance as they are often in pursuit of non-economic related objectives, something that differentiates family and non-family firms (Westhead and Howorth, 2007). These non-economic objectives exist as firm values, attitudes, and beliefs (Cyert and March, 1963). SMEs are often deeply embedded in the local community (Lee 2006; Basco 2013; Bird and Wennberg 2014) which gives a strong sense of commitment and longevity to firms as the entrepreneur's central objective often involves firm longevity (Zellweger et al, 2012; Carmelo et al. 2012). However, it must be noted that evidence of family connections impact on innovation activity is inconclusive and limited (Classen et al. 2014; De Massis et al. 2015).

Lastly, the context of LMT SMEs value chain involves distributors and retailers who are required to deliver offerings to end customers, therefore influencing the innovation trajectory in food sector SMEs. The food business supply chain is influenced by the relative power of these stakeholders which can challenge SMEs to appropriate value from the innovations they develop, given their relative scale (Christopher, 2016). It is increasingly problematic for SMEs in the food sector to establish themselves as price makers (Weiss and Wittkopp, 2005; Banterle, Carraresi, and Cavaliere, 2011) since pricing decisions are influenced by the supply chain and the bargaining or negotiating power of SMEs with the appropriate stakeholders is low (Kizilaslan, Goktolga, and Kizilaslan, 2008). Thus, LMT SMEs in this context are often price takers rather than price influencers (Weiss and Wittkopp, 2005). While our findings highlight how certain LMT SMEs are

experimenting with direct to customer channels as a means of increasing profit margins from their product innovation offerings, the dominant design of the established retail channel means these new channels to market are likely to remain niche and unlikely to provide the scalable growth of the already established channel. The SME context is both a challenging and unique environment within which innovation activity occurs and is therefore worthy of increased study since these firms manage to survive, produce employment and maintain the fabric of the regional ecosystem.

5.2 Type of Innovation

In delving into Tidd and Bessant's four P's of innovation space, we attempt to answer our first research question by highlighting the following issues of discussion. Firstly, LMT SMEs frequently engage in a wide spectrum of innovation types including product, process, position, and to a significantly lesser extent, paradigm innovation, proving that LMT SMEs in the food sector do innovate (e.g. Avermaete et al., 2004; Menrad, 2004; Hirsch-Kreinsen et al, 2006; Kirner et al., 2009; Hervas-Oliver et al, 2011; Som and Kirner, 2015). The relative absence of paradigm innovation may be related to LMT SME context, given its resource constraints, scale and relative power within the ecosystem. Yet, given the nature of paradigm innovation and its rare occurrence in general industry, it is positive that it even registers for LMT SMEs as this indicates a strong awareness of the firm business model and a desire to improve it.

The second of our findings within the innovation outcome of LMT SMEs highlight how the innovation activity of LMT SMEs is primarily incremental. This aligns with the literature of Hirsch-Kreinsen (2008) and is in part, due to resource constraints (Cohen and Levinthal, 1990; Rothwell, 1991; Freel, 2000; Romijn and Albaladejo, 2002; Hervas-Oliver et al., 2011) that inhibit

the exploitation of opportunities derived from novel technologies (Le Bars et al., 1998). Thus, the nature of innovation in LMT SMEs is built up and cumulative over time (Avermaete et al., 2004). Additionally, LMT SMEs in the food sector predominantly rely on existing capabilities for innovation (Hirsch-Kreinsen, 2008; Hervas-Oliver et al., 2011) meaning there is a lower likelihood of radical innovation outputs since that would require transformation capability development and investment. Furthermore, while incremental innovation has a higher probability of success, there is less opportunity for the appropriation of supernormal returns, given its lack of novelty. This reinforces the dominant design of LMT SMEs and inhibits movement up the value chain.

LMT SMEs recognise process innovation as the dominant focus of their innovation effort as it occurred at a higher frequency and quantity across the range of innovation types. The importance of process innovation is continuously reflected in the literature (Capitanio et al., 2010; Triguero et al., 2013). Such innovation fits well with the incremental and risk-averse nature of LMT SME innovation since much of the process technology introduced is well established and validated by industry, meaning its returns are largely known and understood, highlighting the importance of technology and machinery suppliers (Robertson et al., 2003; Santamaria et al., 2009).

Process innovations range across a spectrum of novelty including the development of new equipment (sometimes custom-built), the acquisition of *'off the shelf'* equipment (sometimes second-hand) from larger firms both within the industry and in analogous sectors, and retrofitting and upgrading existing equipment within the firm. A key consideration of this choice is the relative advantage offered by the various options and the equipment cost relative to available funds of the firm. Thus, due to the resource constraints, LMT SMEs are often forced to curtail the potential

impact of their process innovation activity, which sometimes inhibits competitive advantage and opportunity for transformation to new sectors (Heidenreich, 2009).

Process innovations in LMT SMEs are driven by two factors including push factors and pull factors. Push factors include examples such as reducing manufacturing costs and increasing firm efficiency, while pull factors include customer requests. Both drivers of innovation improve the firm's competitive advantage (Martinez-Ros, 1999; Hall et al., 2009) while also creating greater firm longevity (Love and Roper, 2015). The importance of process innovation is reflected in the common ambitions of LMT SMEs to reduce costs and increase the organisation's manufacturing flexibility rather than increasing the number of firm products adopted by the market and improving market access (Robertson et al., 2003; Heidrenreich, 2009). Process innovations have a substantial knock-on effect on product and position innovations, similarly found in the literature (Reichstein and Salter, 2006). This explains the dominant focus of process innovation in LMT SMEs and also the similar process innovation performance of LMT SMEs in comparison to HT firms (Santamaria et al., 2009; Hervas-Oliver et al., 2011).

Findings highlighted product innovation as the second most prevalent innovation type occurring within LMT SMEs as a result of customer demand, export orientation, the need to diversify from competitors and the close alignment between product and packaging innovations. Thus, while engagement in process innovation is continual, product innovation occurs on an occasional basis with the relative novelty of product innovation being low in comparison to large competitors (Rammer et al., 2009; Som, 2012).

Specific analysis of the food sector highlights packaging innovation as a type of innovation worthy of inclusion in this study due to the close integration between product and packaging innovation, also reflected in the literature (e.g Earle, 1997; Trott and Simms, 2017). The packaging innovations of food sector SMEs are incremental since the resources (R&D investment) required for radical packaging innovation do not exist for LMT SMEs (Baregheh et al., 2012). The importance of packaging innovation is highlighted as it's features are customer facing and used as a marketing tool to enhance product attributes (Wells et al., 2007; Mahalik and Nambiara, 2010; Trott and Simms, 2017).

Drivers of packaging innovation include the perishable nature of food products. Thus, food sector firms are constantly looking to innovate to extend product shelf life as this opens up new markets both domestically and internationally, something highlighted in several cases. Further, drivers include NPD demands since product innovations often require new packaging as it is unlikely that existing packaging is suitable for new products. Therefore, these firms have no option but to continuously innovate within their packaging if they continue to engage in product innovation. Further, drivers of packaging innovations include environmental concerns (Prendergast and Pitt, 1996; Thøgersen, 1999; Rundh, 2005), pressures from continuously increasing supply chain costs (Lockamy, 1995; Rundh, 2005), and increasing competition due to the rise in popularity of own-brand products from retailers (Burt, 2000; Vazquez et al., 2003; Koss, 2007).

Position innovation is ranked as the third most important type of innovation activity among LMT SMEs in our study, highlighting its importance. This emphasises these firms strong market responsiveness, improved marketing capabilities and the reality of the customer-facing nature of

the food industry. While the literature on position innovation in SMEs remains limited (Baregheh et al., 2012), evidence of activity was provided by all cases. This emphasises the close link between product and position innovation since the high level of product innovation in the food sector provides opportunities for the firm to reposition itself in new markets. Drivers of position innovation include process innovations that extend the product shelf life and can provide the opportunity for firms to target markets abroad, previously inaccessible due to the time requirements of the supply chain. Additionally, the growth of niche markets encourages firms to divert resources towards these new markets to capitalise on emerging opportunities. Our findings suggest that based on the higher risk associated with position innovations and the increased drain on limited resources such as management's time and capital, LMT SMEs limit their engagement in this type of innovation (e.g. Kirner et al., 2009). This is not unexpected since such innovations require considerable resources to effectively execute a repositioning in the domestic or international market, something not evident in LMT SMEs.

LMT SME engagement with paradigm innovation is significantly lower than product, process or position innovation. A lack of focus and even potentially an inability of LMT SMEs to leverage paradigm innovation is evident and is perhaps the case due to the limited resources, limited strategic orientation (Singh et al., 2008), the incremental nature of LMT SMEs innovation efforts (Albaladejo and Romijn, 2000; Hirsch-Kreinsen, 2008, 2015) and the dependence on small management teams which limits the range of innovation activity. Therefore, the omission of paradigm innovation is not unexpected since such innovations require considerable resources to effectively execute, not evident in LMT SMEs. These firms also lack the supply chain power to appropriate value by altering the firm business model. If paradigm innovation was to occur, then

it would be something that emerges over significant time, given the risk-averse nature of LMT SMEs and desire to keep existing product lines active.

In summary, although there is a wide spectrum of innovation activities ongoing within LMT SMEs, much goes unreported in official records or promoted by SMEs. This is due to a bias in the R&D literature that equates R&D expenditure with innovation. Yet, while many of the innovation activities of LMT SMEs do not *"comprise creative and systematic work undertaken in order to increase the stock of knowledge*" (OECD, 2015, p. 25 - 27), they benefit the firm and assist its continued survival and growth.

5.3 Innovation Process Model

Following on from the discussion of the innovation types of LMT SMEs, we now highlight the issues related to Tidd and Bessant's Innovation Process Model in an attempt to answer our second research question. While the innovation process is not explicitly documented in standard operating procedures, the management team of LMT SMEs implicitly oversee, understand and manage the four phases, some better than others. This is facilitated by the centrality of the entrepreneur and the relative scale of operations that support the nurturing of innovation. As a result, most interventions in innovation management among LMT SMEs are often reactive, in response to a stimulus with the exception being the highly proactive search phase, fueled by entrepreneurial opportunity recognition. However, the phases of the process such as selection, implementation and capture value exhibit more reactive decision making, as part of the 'trial and error' approach.

LMT SMEs search for innovations through multiple sources and often become embedded in routine practices and ways of working (Christensen, 1997; Bhide, 2000). The search techniques of LMT SMEs are conservative, as these firms often depend on search methods shaped and restricted by existing experience. This is particularly the case of mature industries such as the food sector, which gives rise to similar search methods among food firms given the high degree of similarity between firm business models (Prahalad 2004). Thus, the search for innovations outside the typical parameters can often become inhibited (Leonard-Barton, 1992) and results in search strategies of LMT SMEs focused on incremental innovations that reflect a low-risk environment.

The search for new ideas is mainly reliant on the LMT SMEs supply chain and technology providers as sources of inspiration for all innovation types. Our findings suggest that within the supply chain, LMT SMEs search for innovations often involve the input of lead users and customers relying on information acquisition, leading to a closer alignment with customer needs, also reflected in the literature (e.g Zahra and George, 2002; Gartner and Birley, 2002; Steward-Knox and Mitchell, 2003). The implication of this style of the search process is reflected in the incremental nature of LMT SMEs innovation activity.

Similarly, valuable in the search for innovations is the input of suppliers, consultants and other external firms (e.g. Propris, 2000; Freel, 2000; Romijn and Albaladejo, 2002; Tether, 2002; Heidrenrich, 2009). This reflects the importance of organisations networks as wider networks have a greater potential to search for innovative ideas (Wiklund and Shepherd, 2003). The implication of this for LMT SMEs is reflected in the findings that SMEs learn from the mistakes of other organisations when imitating peer or competitor innovations through improved innovation speed,

quality and success (Earle, 1997; Antonelli and Calderini, 1999; Maskell, 2001), which is vital for LMT SMEs due to their resource constraints (Propris, 2000).

Scanning the external environment when searching for innovations is a positive finding for LMT SMEs, yet these firms are vulnerable to losing scope if they fail to harness more diverse partner types to engage in open innovation (Chesbrough, 2003). This behaviour may be a result of the limited scale achievable for LMT SMEs, the limited number of projects that can be engaged in, the firm's limited absorptive capacity due to small management teams, and the firm's limited resources in terms of finance. Therefore, LMT SMEs have a strong focus on exploitative rather than exploratory search projects (March, 1991; OECD, 2015).

Deeper search techniques that push the organisation's innovation boundaries are evident through small R&D efforts, outlined by Galizzi and Venturini (1996, p. 143) who state that *"even a low R&D intensity is sufficient to determine a relevant flow of new product introduction in an industry where innovation is incremental and technological opportunity is redundant*". These deeper search techniques for LMT SMEs typically involve research institutes (Baardseth, Dalen, and Tandberg, 1999; Avermatae et al., 2003) and equipment suppliers as LMT SMEs lack the internal knowledge and resources necessary to engage in this exploratory search technique. This highlights the importance of technology and machinery suppliers as LMT SMEs are widely considered adopters of HT products from external firms (Pavitt, 1984; Robertson et al., 2003; Santamaria et al., 2009; Hansen and Winther, 2011) to improve survival and growth. This is mainly for process and product innovations as it enhances the firm's ability to manage changes in product features, increase the volume of production and reduce the cost of production (Bender and Laestadius, 2005; Hofmann

and Orr, 2005; von Tunzelmann and Acha, 2005). Findings from this study suggest that LMT SMEs in the food sector are not as dependant on suppliers of technology as the majority of the literature suggests (e.g. Pavitt, 1984; Heidrenreich, 2009; Hervas-Oliver et al., 2011; Nouman et al, 2011). Pavitt's (1984) taxonomy outlines how suppliers are the most important source of information and knowledge, mainly for process innovations (Pavitt, 1984; Heidenreich, 2009). However, they do not dominate food sector innovation activities, as the literature suggests, since a strong relationship with alternative stakeholders such as customers is considered more important in this study.

The second phase managed by LMT SMEs is selecting which innovations to progress and is closely aligned to the firm's strategy and culture. Our findings highlight that while some of the larger SMEs included in this study developed defined strategic plans with explicit alignment as part of a stage-gate process to nurture organisational innovation, this was often undermined by the strong entrepreneurial orientation of LMT SMEs. Thus, very often, no explicitly defined strategy existed and where it did, it was sometimes overwritten by the entrepreneurial intuition of the MD. While this entrepreneurial orientation provided advantages in the form of high agility and responsiveness to emerging opportunities, it also sometimes resulted in a lack of due diligence that created the need for latter corrective action or even abandonment.

Furthermore, SMEs often engage in a limited number of innovation projects due to resource constraints, both financial and human resources that exist based on the nature of the firm. Our findings suggest that LMT SMEs tend to select short term innovation projects rather than long term projects due to their higher demand on firm resources, longer periods without validation or

success and the higher degree of risk associated, similarly reflected in the literature (e.g. Cooper and Kleinschmidt, 1996). Thus, the LMT SME selection criteria underpin the incremental nature of innovation and the short term perspective of the firms in terms of the innovation trajectory. However, this provides the opportunity for LMT SMEs to refrain from extensively planning out innovation projects as the selection of innovation projects is based on how the circumstances change as the project progresses. The criteria used to approve an innovation project are a combination of cost controls and potential opportunity metrics that reflect the constraints and entrepreneurial opportunity recognition of LMT SME context.

Our study highlights how LMT SMEs often only engage in a more ambitious selection of innovations that involve a higher degree of risk, provided the innovation can be achieved using the firm's existing resources and capabilities since developing new capabilities are constrained based on the firm's limited resources. This is supported by Bessant et al (2009) while many of the selection metrics were implicit with a high level of commonality across the sector and a strong focus on exploitation and returns in the short to medium time window. While their relative importance did shift depending upon the external or internal context, this was a common trait of idea selection. This may indicate the need for policymakers to nurture LMT SMEs to engage in explorative focused initiatives and for management to incorporate metrics that allow such projects onto the innovation portfolio. This may enhance the relative novelty of the SME while also contributing to their profitability and growth. However, this may not easily fit with the organisational context and culture and should be slowly implemented to avoid creating a *'millstone'* around the SMEs neck.

Our research finds that the fluid and explicit nature of the metrics (although main ones are generally consistent) may align with the entrepreneurial founder's desire for control and ability to advance initiatives they feel important to the organisation. However, Greiner (1989) shows that as firms scale, the need for greater formality and efficiency of routines is required. While LMT SMEs would benefit from the implementation of an explicit innovation process model, they should remain cautious as they may not have the necessary resources to critically plan, outline and communicate formal innovation process plans (Kaufmann and Tödtling, 2002; Massa and Testa, 2008) and so scaling and investment is required.

The third phase of the innovation process managed by LMT SMEs involves implementing the innovations that are selected to progress. The implementation phase is closely aligned to the DUI mode of learning with a trial and error approach central to this phase. Thus, innovation in LMT SMEs is predominantly project-orientated and is reactive rather than proactive (Miner, Bassoff, and Moorman, 2001). This phase highlights a lack of due diligence among LMT SMEs throughout the innovation process model (Hirsch-Kreinsen and Jacobson, 2008; Santamaria, Nieto, and Barge-Gill, 2009, Som and Kirner, 2015), mainly due to multiple ongoing projects. Given the small management team and need to run the day to day operations, LMT SMEs implementation phase can sometimes be neglected. Thus, the desire for innovation agility is reflected while the attitude among LMT SMEs is to fail fast and fail early. This is reflected in the high level of product innovation failure rates in the food industry, highlighting a challenge experienced by SMEs when it comes to market entry (Stewart-Knox and Mitchell, 2003; Trott and Simms, 2016). Thus, numerous scholars believe SMEs should engage in a more structured and formal innovation management style to improve the innovation success rate (Bessant and Tidd, 2007; Prakash and

Gupta, 2008; Terziovski, 2010; Hervas-Oliver, 2011). However, greater structure and more defined roles can increase costs leading to a reluctance amongst SMEs.

The final phase of the innovation process model outlines the value captured from the innovations of LMT SMEs, mainly derived from product, position and process innovations. While product innovation is important to growth, our findings highlight how process innovation underpins this growth and ensures the continued survival of LMT SMEs. Process innovations are related to manufacturing cost reductions, production capability improvement, and increased efficiency (Neely et al., 2001). LMT SMEs also capture value in the form of improved firm perceptions from other market players, such as distributors and food manufacturers leading to an increase in brand value, potential collaborations with superior partners, and recruitment of a higher quality workforce.

The competitiveness of mature industries such as the food sector creates a need for firms to innovate to increase firm efficiency, productivity, profit, and market share (Neely et al., 2001; Freel and Robson, 2004). Thus, while the outcomes of innovation are mainly positive, negative consequences associated specifically with product innovation are evident in the high product failure rate among the LMT SMEs. However, while innovations do fail in LMT SMEs, the negative impact concerning value appropriation and damage to the firm is minimised due to the incremental nature of innovation, the reduced input costs, the speed of action and the DUI mode of learning minimising the downside associated with innovation failure. Furthermore, Rosenbusch et al. (2011) find that SMEs engaging in a strategic innovation orientation can reduce innovation failure

rates by developing more ambitious objectives, allocating resources more effectively, and creating an innovative culture.

The literature is critical of the lack of formal innovation processes in SMEs (March-Chorda, Gunasekaran, and Lloria-Aramburo, 2002; Scozzi, Garavelli, and Crowston, 2005) and the lack of strategic planning (Hirsch-Kreinsen and Jacobson, 2008; Santamaria, Nieto, and Barge-Gill, 2009) as the innovation process in SMEs is often ad hoc and implicit rather than structured and explicit (Hoffman et al., 1998; March-Chorda et al., 2002; Hirsch-Kreinsen and Jacobson, 2008; Som and Kirner, 2015). The implicit strategies of LMT SMEs are embedded in the knowledge of the small management team, highlighting the high dependence on a few individuals. While the implicit, informal and ad-hoc nature of LMT SMEs innovation management often brings about advantages such as the ability to deal with changing environments (Pullen et al., 2009), it is predominantly considered a weakness. Thus, it is suggested that SMEs should develop well defined and organised innovation processes with explicit phases and systems to increase the success rate of innovations (Kahn et al., 2006). Formal innovation processes are widely regarded as best practice (Kahn et al., 2006; Barczak, Griffin, and Kahn, 2009) as defined plans, structures and tasks increase innovation success (Cooper and Kleinschmidt, 1996; Ettlie and Elsenbach, 2007). Furthermore, the lack of a formalised structure in terms of how they search, select, implement and capture value from innovations impacts their productivity, effectiveness and efficiency (Bessant and Tidd, 2007; Prakash and Gupta, 2008).

5.4 Capabilities

Following the analysis and discussion of the types of innovation engaged in and the process by which firms manage their innovation activity, we now focus our attention to our third research question that seeks to understand "*What capabilities underpin LMT SMEs ability to innovate to facilitate survival and growth?"* by asking a series of propositions. This brings us onto the discussion of LMT SMEs collaboration capabilities as identified in the analysis of the innovation management process of the cases.

5.4.1 First Order Propositions

5.4.1.1 Collaboration Capabilities

Our first order proposition highlights how *"collaboration supports LMT SME innovation capability"*. This collaborative capability is core to the innovation activity of LMT SMEs as organisations rely on external entities to innovate since firms can no longer rely on internal sources when engaging in innovation activities (Chesbrough, 2003), given firm resource constraints, limited capabilities, and the advantages of risk-sharing associated with innovation projects. Thus, LMT SMEs are motivated to develop and maintain their collaborative capabilities to survive and grow. However, since LMT SMEs by definition have no or low R&D intensity, the absorptive capacity of these firms is often overlooked. Thus, their ability to identify, access and assimilate knowledge external to the firm is often considered a weakness (Cohen and Levinthal, 1990; Mowery et al., 1996; Vega-Jurado et al., 2008; Hervas-Oliver et al., 2011). Yet, in line with this study, several scholars have found that LMT firms engage in innovation through external knowledge acquisition and collaborations with external organisations (Rammer et al., 2009; Barge-

Gil, 2010; Huang et al., 2010) suggesting LMT SMEs are capable of identifying and capitalising on external knowledge (Bender and Laestadius, 2005).

Our findings outline how information is continuously shared across boundaries and ideas are regularly exchanged, leading to an increase in innovation novelty, which is widely agreed within the literature (Zaltman, 1986; Menon and Varadarajan, 1992; Han et al., 1998; Im and Workman, 2004). LMT SMEs establish networks that allow firms to share resources across boundaries, providing the opportunity to compensate for their resource constraints. A key driver of innovation is the knowledge and information that exists beyond the boundaries of the firm (Chesbrough and Crowther, 2006). Additionally, it is often cheaper for LMT SMEs in the food sector to outsource an element of production or even a service to an organisation in their network rather than develop the capabilities and acquire the necessary equipment themselves. The implication of this is reflected in the reduced risk associated with innovation as external entities bring with them experience, expertise, and resources while also spreading the risk across different organisations (Mohr and Spekman, 1994; Hoffman and Schlosser, 2001).

Since collaborations with external organisations provide increased access to resources, expertise, and capabilities unattainable to SMEs in isolation, LMT SMEs can experience the advantages associated with large organisations provided they leverage this capability (Nooteboom, 1994; Maskell, 2001; Døving and Gooderham 2008; Nieto and Santamaria, 2010). Hirsch-Kreinsen et al. (2005, p. 23) claim that *"external collaboration helps in overcoming the limitations of a firm's own resources and know-how in developing new production and innovation potential"*. The limited resources available to LMT SMEs means that while they can manage internal capabilities,

they have adapted to leverage the capabilities of external firms (Dodgson, 1991; Hoffman et al., 1998). While Heidenreich (2009) suggests that LMT SMEs are less likely than their HT counterparts to engage in innovation-oriented alliances, this study suggests that irrespective of high dependency on internal capabilities, LMT SMEs rely on external sources of knowledge, expertise and information when engaging in innovation activities. This is widely reflected in the literature as SMEs are engaging extensively in open innovation activities and the frequency in this engagement is continuously rising (Propris, 2000; van de Vrande et al., 2009; Hervas-Oliver et al., 2011) suggesting that firm networks in the LMT classification are key to innovation activity.

Additionally, our findings highlight a significant reliance by LMT SMEs in the food sector on the innovations of firms in export markets since these innovations have already been validated by market acceptance or failure. Thus, SMEs ability to learn from the strategies and development paths of their peers often improves their innovation success rate (Earle, 1997; Antonelli and Calderini, 1999; Maskell, 2001) by reducing uncertainty through already successful innovation imitation. The implication of this is reflected in the increased success rate of innovations, however, the nature of innovations is considered incremental rather than defined by any real degree of novelty.

The relationship with external entities and individuals for LMT SMEs in the food sector tend to be informal (Nouman et al, 2011) and are often in the form of non-equity collaborations with suppliers and consultants (Klevorick et al., 1995; Lee et al., 2001; Hervas-Oliver et al., 2011) rather than with research centres and the STI mode of innovation (Mowery and Rosenberg, 1999) since these informal relationships are often preferred by SMEs over formal relationships such as

university collaboration (Massa and Testa, 2008). It was found that LMT firms engage in collaborations with research centres and universities much less frequently than their HT counterparts (Kirner et al, 2009). These informal collaborations provide the opportunity for LMT SMEs to acquire practical knowledge through the firm's closeness to suppliers and peer SMEs (Barge-Gil, 2010; Huang et al., 2010; Rammer et al., 2009). In particular, engagement with suppliers is vital for process innovation since many of the standardized systems or technologies acquired by LMT SMEs are further developed to the bespoke requirements of the firm which requires communication and collaboration between the organisation and the supplier (Hirsch-Kreinsen, 2008). Thus, LMT SMEs are often purchasers of HT machinery developed by HT firms (Garibaldo and Jacobson, 2005; Santamaria et al., 2009).

In terms of formal relationships, an exception includes collaborations with particular food sector government agencies specifically established to support SMEs as these initiatives closely align with the case studies ambitions. LMT SMEs lack the necessary capabilities and resources to engage in formal R&D activities in isolation (Von Hippel, 1988; Baardseth, Dalen, and Tandberg, 1999; Katila and Ahuja 2002; Laursen and Salter 2006). While the literature suggests that formal collaborations with research centres, universities (Hervas-Oliver et al., 2011) and government bodies are important for innovation, they are not widely used. Further engagement with universities and government bodies could lead to more radical innovations for LMT SMEs which would have a significant positive effect on the innovation performance of these firms, which is something that could be supported by policymakers.

Lastly, the innovations of LMT SMEs are often driven out of necessity and are reactive rather than proactive meaning collaborative innovation projects occurred without evidence of any real strategic orientation. Thus, LMT SMEs refrain from engaging in explorative approaches to innovation management in terms of collaborative projects, which if engaged in could provide fruitful benefits to SMEs in terms of innovation output. However, the small management teams and the high dependence on the entrepreneur limits the potential for LMT SMEs to engage in such explorative innovation management, regardless of the possible benefits.

In summary, collaborations lead to an increased flow of knowledge and idea exchange which lead to greater opportunities (McEvily and Zaheer, 1999; Lee et al., 2001; Capaldo, 2007), particularity in the introduction of advanced technologies that are unattainable for SMEs in isolation (Todtling et al., 2009). Thus, these external linkages can significantly improve firm innovation efforts (Caloghirou et al., 2004; Hanel and St-Pierre, 2006; Vega-Jurado et al., 2008; Albors-Garrigos et al., 2009). However, irrespective of the significant value and often the necessity of external collaborations due to resource constraints, a preference for leveraging internal, firm centric resources and capabilities is evident in LMT SMEs to facilitate survival and growth.

5.4.1.2 Market Orientation and Understanding

Our findings support our second proposition that *"Marketing ability supports LMT SME innovation capability"*. Market orientation and understanding are central to the innovation activity of food sector SMEs (Earle, 1997; Grunert et al. 1997; Borch and Forsman, 2000), and in particular, product, process and position innovations (Le Bars et al., 1998). This is the case since innovation is a market-driven process that relies on market information and understanding to

develop new products, increase market share, and grow (Hirsch-Kreinsen, 2008; Robertson et al., 2009; Grimpe and Sofka, 2009; Kirner et al., 2009). The marketing capabilities of LMT SMEs support their ability to identify sources of market information, engage with these knowledge sources and leverage customer-related information (Li and Calantone, 1998; Yassine and Wissmann, 2007).

The marketing capabilities of LMT SMEs are shaped by resource constraints that require them to identify creative ways of marketing that do not drain the firm's resource base, given many channels are outside their price range. Thus, marketing knowledge acquisition often occurs through informal channels and leverage of information from within the supply chain partners, equipment producers and trade conferences. Our study highlights the increasingly common involvement of customers or users in LMT SME innovation projects. This is supported by the majority of literature that suggests innovation in LMT SMEs is driven by customer-focused and practical knowledge (Hirsch-Kreinsen, 2004; Tunzelmann and Acha, 2005; Hirsch-Kreinsen, 2008; Heidenreich, 2009). Acquisition of this practical knowledge is achieved through firm proximity to the market and collaboration with customers (Rammer et al., 2009; Santamaría et al., 2009; Santamaria, Nieto, & Barge-Gill, 2009; Barge-Gil, 2010; Huang et al., 2010; Hirsch-Kreinsen, 2012). This is perhaps due to the lack of investment in R&D but also the ever-changing customer requirements and competitive landscape (Helfat and Winter, 2011) meaning LMT SMEs are in constant communication with important stakeholders to survive and grow (Von Hippel, 2005; Gassmann, 2006). From a marketing knowledge dissemination perspective, cost-efficient channels are heavily leveraged, with in-store promotion being a preferred method. This risk-averse marketing approach results in more organic growth as a consequence of any new product introduction but also ensures

that negative reaction of market introduction can be rectified through responsive agility (DUI learning) and a threat to SME sustainability is minimised.

Our findings suggest that the small management teams of LMT SMEs spend time engaging with and maintaining close proximity to the market as it increases the customer-oriented stock of knowledge available to SMEs which reduces innovation failure rates (Steward-Knox and Mitchell, 2003). Marketing capabilities are reflected in the firm's ability to appropriately manage consumer relationships (Battor and Battor, 2010), engage in market research and improve customer service, all of which leads to improved innovation performance (Avermaete et al., 2004). However, the implication of this strong customer and competitor focus leads to innovation imitation and innovations that are incremental, also reflected in the literature (e.g. Christensen and Bower 1996; Lukas and Ferrell, 2000).

The significance of LMT SME marketing capabilities resides in its influence over other organisational capabilities. Thus, the organization's marketing capabilities directly impacts its ability to identify and absorb external knowledge (Su et al., 2013) which underpins the collaborative capabilities of LMT SMEs. Since LMT SMEs are defined by small management teams, it is no surprise that these firms have developed and maintained capabilities that are complementary, meaning that a few individuals may develop and leverage this capability.

5.4.1.3 Entrepreneurial Orientation

Our findings support our third proposition, *"entrepreneurial orientation supports LMT SME innovation capability"*. The firm's entrepreneurial orientation has continuously reflected a positive

effect on organisation innovation performance (e.g. Covin and Miles, 1999; Smart and Conant, 1994; Wiklund and Shepherd, 2003). The owner or entrepreneur is considered more influential in small firms than in large organisations (Mascitelli, 2000) since the strategic decision making of LMT SMEs is led by the entrepreneur while larger firms are governed by bureaucratic structures (Bamberger et al., 1990). Reflected in the attention-based theories of the firm (Simon 1979; Ocasio 1997), managerial attention is one of the most valuable, rare and inimitable resources available to the firm. Thus, since LMT SMEs by their nature are resource-constrained, they effectively allocate the entrepreneurs attention to innovation projects.

The entrepreneurial orientation of LMT SMEs is at the heart of LMT SME innovation capability, something firm centric (internally controlled), underpinned by years of experience and insights. It is core to their innovation activity to recognise opportunity potential, overcome resource constraints and nurture innovation development. Our findings suggest that few, if any decisions are made without the director's consultation and approval. However, the entrepreneurial orientation of LMT SMEs not only exists in the MD but also in key individuals of small management teams. This dynamic between the MD and upper-level managers is central to innovation activity in debating and challenging the existing way of doing things and therefore broadening the scope for potential innovation.

While the LMT SMEs MD's education is one of experience rather than formal qualification, our findings highlight that LMT SMEs hire educated and experienced management teams and individuals as the organisation grows to complement their entrepreneurial capability, address some of their knowledge blind spots/ad hoc approach and bring more structure and organisation to the

firm. Yet, the literature is conflicting since some studies found that post-school qualifications developed skills such as communicative and learning capabilities that are all essential for innovation activity (Cohen and Levinthal, 1989; Leiponen, 2005), while more recent studies found no correlation between the entrepreneur's education and innovation (Romijn and Albaladejo, 2002).

This study finds that the agility of SMEs strategies provides the opportunity to pursue emerging opportunities that are unachievable for larger firms, providing a major competitive advantage for small firms. However, while the flexibility, agility and centralised decision making of LMT SMEs can be interpreted as a competitive advantage, it is also a vulnerability as the firm is dependant on the experience, knowledge, and competence of few individuals which can hinder growth. While much of the literature criticises the implicit and emergent strategic orientation of SMEs embedded in the entrepreneur's tacit knowledge, the adverse consequences of entrepreneurial decision making can often be quickly reversed or reconfigured to a more beneficial outcome. Thus, the innovation capabilities of LMT SMEs are rarely strategically planned, rather they are emergent as the firm grows and develops.

Lastly, the entrepreneurial orientation of the firm has a significant influence on other firm capabilities. LMT SME entrepreneurs spend a significant amount of time exercising their marketing orientation in the search for sources of knowledge and information that uncover the needs of customers (Slater and Narver, 1998; Cormican and O'Sullivan, 2004) in an attempt to identify opportunities that enhance their competitive advantage (Covin and Miles, 1999). Thus, LMT SME entrepreneurs appear to be constantly looking for opportunities to pursue. This is

reflected in the trial and error approach to innovation adopted by entrepreneurs of LMT SMEs. Additionally, their strong process knowledge and technical expertise give rise to creativity through this experimentation and trial and error approach. This is perhaps due to the limited resources available to LMT SMEs that encourages a greater degree of risk management through engagement in more frugal innovation.

5.4.1.4 Learning Capabilities - DUI Mode of Learning.

Our final proposition, *"Learning capacity supports LMT SME innovation capability"* is supported by our findings that LMT SMEs predominantly depend on the DUI mode of innovation, characterised by incremental problem solving through practical, formalised and implicit knowledge such as everyday experience developed over some time. While this is not widely regarded in the literature, non-R&D intensive activities of firms are central to their innovation activities, particularly in LMT firms as non-technological and informal activities are considered more important for innovation in SMEs (Cohen and Levinthal, 1990; Albaladejo and Romijn, 2000; Muscio, 2007; Hirsch-Kreinsin, 2008; Hall et al., 2009; Rammer et al., 2009; Santamaria's et al. 2009).

This study highlights how the DUI mode of innovation adopted by LMT SMEs is supported by the acquisition and use of advanced manufacturing technologies such as machinery and equipment. (Rosenberg, 1982; Gatignon and Xuereb, 1997). This provides opportunities to engage and interact experimentally through a trial and error approach (Hirsch-Kreinsen et al., 2003; Wuyts et al., 2004) rather than the large scale, more radical innovation of the STI mode of innovation. Our findings suggest a low reliance among LMT SMEs on the STI mode of innovation since these firms by

definition, spend less than 3% of turnover on R&D activities (Hirsch-Kreinsen, 2008; Som and Kirner, 2015) and instead develop innovations from sources other than breakthroughs in science and technology. The implication of DUI in SMEs reflects the firm's ability to improve efficiency and productivity in terms of performing certain routines or tasks through repetitive practices that are vital for firm innovation efforts and growth (Gatignon and Xuereb, 1997; Tether, 2002; Koberg et al., 2003).

Additionally, our findings highlight how DUI reflects the interactions within the firm and also external interactions with entities outside of the organisation. It is suggested that these interactions with customers, suppliers, and other partners are essential to the learning that goes on in LMT SMEs (Kline and Rosenberg, 1986; Chipika and Wilson, 2006) as these interactions create numerous learning opportunities and therefore innovation through access to knowledge and information (Edquist, 1997; Tether, 2002; Romijn and Albaladejo, 2002; Lundvall, 2010). In particular, organisations and small firm’s networks are frequently considered a knowledge source for the entrepreneur to learn (Szarka, 1990; Shaw, 1998). This finding aligns with that of Chell and Baines (2000) who found that SME owner-managers leverage other owner-managers, customers and even existing employee information and knowledge. However, these ideas and suggestions provided by external entities including customers and suppliers are understood to lead to more incremental innovation rather than any radical degree of novelty often associated with the information provided by research institutes (Hirsch-Kreinsin, 2008). This is the case as LMT SME resource constraints result in a conservative approach to risk management as they try to protect the firm. Therefore, small firms and in particular, family businesses are risk-averse in their operations

(De Massis et al., 2015) by adopting a DUI mode of innovation, limited R&D expenditure, and incremental innovation orientation.

5.4.2 Second-Order Propositions

Our second order propositions reflect two approaches to innovation including the view that: innovation supporting capabilities are firm centric (internally controlled) to LMT SMEs versus the view that innovation supporting capabilities are external (ERBV) to LMT SMEs. However, as evident in this discussion, this emphasis on internal and external resources is not a dichotomy but instead a symbiotic relationship since strong internal resources are required to enable the SME to absorb and apply external knowledge resources. LMT SMEs leverage both approaches as they rely on firms in their external environment to address gaps in their internal capabilities to advance innovation. While highly conscious of the potential value (and often a necessity) of external resources, there would seem a preference amongst the sample to leverage internal resources in the first instance. This aligns with the view of Som and Kirner (2015) and Lindman (2002) and highlights that LMT SMEs have a desire to grow their internal resource base and rely on their capabilities to achieve growth and scale. This reliance on internal capabilities increases the value captured from innovations as it doesn't need to be shared. Additionally, LMT SMEs perhaps have a fear of being exploited by external organisations, particularly if a close relationship hasn't been established to build trust between firms. However, in the second instance, attracting and accessing external resources was found to be vital to innovation due to the high dependency on suppliers of equipment and machinery (Heidrenreich, 2009; Hervas-Oliver et al., 2011) and the limited resources available to LMT SMEs (Love and Roper, 2015) as identified in the process innovation

discussion of the innovation outcomes. For a graphical representation of the key findings link to theory, see table 39 below.

Table 39: Key Findings link to Theory.

Core Theme	Key Findings	In support of literature by
	Research Question One: Do LMT SMEs innovate to facilitate survival and growth? Model Test: Tidd and Bessant's Four P's Model.	
Innovation occurring.	LMT SMEs do innovate for survival and growth.	Hullova et al., 2019; Heidrenreich, 2009.
Incremental Innovation dominates.	LMT SMEs innovation output is primarily incremental, with little evidence of radical innovation across the innovation types of the cases studied.	Love and Roper, 2015; Hervas-Oliver et al., 2011.
Process Innovation dominates.	Process Innovation is the predominant type of innovation undertaken within LMT SMEs, both in terms of quantity and strategic importance for the firm, followed by regular product innovation. While product innovation contributes by increasing market share and potential profit margin, process innovation not only reduces the SMEs cost base to counteract the advantages of economies of scale of larger firms but also provides new manufacturing capability that drives future product innovation.	Trott and Simms 2017; Kirner and Som, 2015.
Position innovation is sporadic.	LMT SMEs do show evidence of engagement in position innovation, primarily with an internationalisation focus. However, little to no paradigm innovation was evident in the SME cases studies.	Dooley and Som, 2018; Robertson et al., 2009.
Innovation is ongoing and dynamic.	LMT SMEs innovation activity is an ongoing and dynamic phenomenon, not only contributing to LMT SMEs continued survival and growth in the face of global challenges but also to the health of the regional economy.	Dooley and Som, 2018; Hirsch-Kreinsen, 2015.

STI mode of innovation is low.	The incremental nature of innovation undertaken by LMT SMEs highlights that the STI mode of innovation (R&D) source of innovation is low. Primarily LMT SME innovations are existing technology adoptions (e.g. process innovation). While these firms have low engagement in breakthrough R&D as an innovation source, their creativity, entrepreneurial orientation and market responsiveness ensures a rich pipeline of innovations for sustainability and competitiveness.	Hirsch-Kreinsen, 2015; Kirner and Som, 2015.
	Research Question Two: How do LMT SMEs manage their innovation activity? Model Test: Tidd and Bessant's Innovation Process Model.	
Innovation management is often implicit and ad hoc.	While management of the Innovation Process is evident in all cases studied, its nature is often implicit and ad hoc, centralised within several key individuals (e.g. entrepreneurial MD). Consequently, interventions in the Innovation Process are often ad hoc in response to a crisis or the stimulus of opportunity recognition. The innovation Search phase is highly proactive driven by entrepreneurial opportunity recognition. However, other phases of the process such as Implementation exhibit more reactive decision making evolving as part of 'trial and error'.	Som, Kirner and Jager, 2015; Hirsch-Kreinsen and Jacobson, 2008; Goffin and Mitchell, 2005.
LMT SMEs are resource-constrained.	The resource-constrained nature (financial, knowledge and capability) of LMT SMEs limits both the scope and scale of innovations accessible to the firm. The timeline for the majority of innovation return is understandably short (1-2 years) and something which aligns with the incremental innovation nature and risk management highlighted in RQ1. A positive of this constrained context is that LMT SMEs instinctively look to external sources when faced with innovation development constraints. However, this leverage of external resources is largely constrained to their existing network, something which may inhibit radical innovation opportunities.	Hirsch-Kreinsen, 2015; Pullen et al., 2009.
Leverage internal and external sources for innovation.	At the Search phase, LMT SMEs are shown to leverage a wide range of innovation sources, harnessing both internal and external sources to 'feed the pipeline'. The engagement of 'downstream' supply chain stakeholders was highly evident, not only as a source of emerging market trends but also as a channel for market adoption and commercialisation.	Dooley, and O'Sullivan, 2018; Weidner and Som, 2015; Heidrenrich, 2009.

Innovation selection is aligned to strategy and culture.	While some of the larger SMEs had a defined strategic plan to nurture explicit alignment as part of a stage-gate process, the strong entrepreneurial orientation of the firm sometimes meant no explicit strategy existed and even when it did, it was sometimes overwritten by the entrepreneurial MD. While this provides the firm with high agility and responsiveness to emerging trends, it can also result in a diverse portfolio of actions and lack due diligence.	Hullova et al., 2019; Alsaaty, 2011.
Few explicit routines and practices exist.	At the Implementation phase, few explicit routines and practices for systematic management of the innovation development exist. Interventions are heavily project-specific, with the entrepreneurial orientation of the team and the dominant trial and error approach of DUI learning highly evident, resulting in opportunistic pivots as development progressed.	Trott and Simms, 2016; Tidd et al., 2001.
Productivity and efficiency improvement focus.	Given process innovation importance, the value captured from innovation activity primarily involved improving productivity and efficiency in production, contributing to firm survival. However, the value captured from product innovation and position innovation efforts was typically reflected in increased firm turnover, contributing to firm growth.	Freel and Robson, 2004; Neely et al., 2001.
MD influence resides as firm scales.	As LMT SMEs scale, there is evidence of more structure with formalized routines and practices for innovation management. This may be a consequence of the dilution of the entrepreneurial MD influence or a natural response to increased innovation activity that makes it impossible for one person to maintain oversight.	Tidd and Bessant, 2018.
	Research Question Three: What capabilities underpin LMT SMEs ability to innovate to facilitate survival and growth?	
	Proposition One: Collaboration supports LMT SME innovation capability.	
Collaboration is core to innovation activity.	Given the resource-constrained nature of LMT SMEs, collaboration is a core capability supporting innovation as LMT SMEs engage with external sources to advance innovation projects. Leverage of external resources tends to be heavily skewed towards informal relationships based on reciprocity/mutual benefit and rarely take the form of equity-sharing collaborations.	Dooley and O'Sullivan, 2016; Nouman et al, 2011; Cormican and Dooley, 2007.

Innovation is largely exploratory.	Leverage of external resources is based on the requirements of the specific project context, occurring for both exploratory and exploitative purposes. However, within our sample, activity is heavily skewed towards the frontend of the process (exploratory). LMT SMEs leverage a wide range of collaborative partners such as suppliers (as purchasers of HT equipment), consultants, and customers but the selection is biased towards the supply chain and personal network of the entrepreneur. Given the low leverage of partners in analogous industries or public research institutions, findings indicate significant scope for LMT SMEs to increase the breadth and depth of partner collaborations to support their innovation process.	Dooley and O'Sullivan, 2018; Weidner and Som, 2015.
The centrality of employee teamwork.	Collaboration has both an internal and external focus to support innovation efforts. Integration of employee groups, guided by management teams provides the firm with a high level of creativity, agility and responsiveness to emerging opportunities. This is especially true of process innovation, where tacit knowledge and curiosity of employees is core to the trial and error experimentation that underpins development.	Weidner and Som, 2015; Hirsch-Kreinsen et al., 2005.
LMT SMEs initially exploit internal resources.	LMT SMEs collaborative capability supports all innovation activity but firms have a preference to initially exploit internal resources before harnessing external resources and capabilities (reflected in the ERBV). Such practice impacts all phases of the innovation process model but is particularly influenced by the desire to optimise value capture in the commercialisation phase.	Hullova et al., 2019; Hervas-Oliver et al., 2011; Massa and Testa, 2008
	Proposition Two: Entrepreneurial orientation supports LMT SME innovation capability.	
Entrepreneurial orientation of the MD is core to innovation activity.	Findings highlight the entrepreneurial orientation of the MD as core to innovation activity of the SME, both in recognising opportunity potential, creatively overcoming resource impediments and nurturing development. Thus, few decisions are made without the director's approval and their position at the interface between operational capability and market opportunity allows them to alter the nature of their innovation focus. This entrepreneurial orientation is at the heart of LMT SME innovation capability, something firm centric (internally controlled) and underpinned by years of interactions, experience and insights.	Dooley and O'Sullivan, 2018; Sloane, 2017; Perez-Luno et al., 2011

Entrepreneurial orientation exists in management.	The entrepreneurial orientation of LMT SMEs not only exists in the MD but also key individuals of management teams, given their sense of connection to the company. The dynamic between these is important for innovation activity in debating and challenging the scope for potential innovation.	Dooley and O'Sullivan, 2018; Hirsch-Kreinsen, 2015.
As LMT SMEs scale, levels of management and bureaucracy increase.	While the LMT SMEs MD's education is one of experience rather than formal qualification, they often seek to address this structural hole by hiring more formal/traditionally educated managers to complement their entrepreneurial capability. Our findings suggest that as LMT SMEs scale, the entrepreneurial orientation of the firm is diluted as tradeoffs occur with the need for greater systemisation to maintain control and direction. This can cause tension between entrepreneurial drive and formalised system requirements but it also supports great quantity/scale of innovation activities and increased due diligence.	Leiponen, (2005). Yet, research by Romijn and Albaladejo (2002) conflicts with our findings.
	Proposition Three: Marketing ability supports LMT SME innovation capability.	
Production capability and emerging market opportunity alignment.	The lynchpin position of the entrepreneurial MD at the interface between production capability and the emerging market opportunity is at the heart of LMT SME innovation capability.	Hirsch-Kreinsen, 2015; Heidrenreich, 2009.
Strong customer engagement and understanding.	Consistent and deep interaction with the customer base by SME not only provides an important channel for communicating the value proposition to the market but also provides a deep insight into future market opportunities and requirements. Resource constraints require LMT SMEs to find creative ways of marketing and market introduction. Often marketing knowledge acquisition occurs through informal channels and leverage of information from within the supply chain partners, equipment producers and trade conferences. From a marketing knowledge dissemination perspective, cost-efficient channels are heavily leveraged, with in-store promotion preferred method. This risk-averse marketing approach results in more organic growth as a consequence of any new product introduction but also ensures that negative reaction of market introduction can be rectified	Wu, 2013; Heidrenreich, 2009; Robertson et al., 2009.

	through corrective action agility (DUI learning) and minimise the threat to SME sustainability.	
The centrality of the customer for innovation activity.	Marketing orientation, a firm centric (internally controlled) capability, plays a key role in how LMT SMEs product and position innovations, given strong customer/retailer engagement in the search and select phase of the innovation process.	Hirsch-Kreinsen, 2015.
	Proposition Four: Learning capacity supports LMT SME innovation capability	
DUI mode of innovation is dominant.	The trial and error nature of innovation development in LMT SMEs ensures that learning is a key innovation capability. The dominant learning mode of LMT SMEs is that of DUI, aligning with the entrepreneurial orientation of the firm. Similarly, resource constraints make STI learning out of reach for SMEs in terms of both financial and investment time limitations. The knowledge exchange underpinning learning and subsequent innovation is tacit, heavily relational based and embedded in the existing supply chain. Knowledge acquisition is absorbed by key individuals, blended with entrepreneurial creativity to solve pressing problems and exploit opportunities through ongoing trial and error approach.	Hirsch-Kreinsen, 2015; Som, 2012; Hansen and Winther, 2011; Santamaria et al., 2009.
STI mode of innovation is low, yet R&D efforts exist.	While STI mode of innovation has less relevance for LMT SME innovation, R&D efforts do exist, with specific firms demonstrating a commitment to R&D above the sector level norm by leveraging the R&D efforts of suppliers such as equipment producers as inputs to their efforts. Greater leverage of R&D is primarily within larger-scale SME possessing additional resources to support such initiatives and engagement with public research centres.	Kirner and Som, 2015; Hervas-Oliver et al., 2011; Romijn and Albaladejo, 2002.

6 CHAPTER SIX - CONCLUSION

The purpose of this research was to *explore if and how LMT SMEs innovate for survival and growth*. The importance of innovation is continuously reflected in the literature and is widely regarded as being central to firm survival and growth (Porter, 1998; O'Sullivan et al., 1998; Tidd et al., 2001). Furthermore, the importance of SMEs in stimulating job creation and economic activity within local economies, Ireland and Europe is continuously highlighted in the literature (Storey, 1994). In the Irish context, a large portion of SMEs exists within the LMT classification and operate within the low tech food industry. While innovation management literature has largely focused on the innovation activity of large HT firms highlighting the importance of R&D for innovation (Hirsch-Kreinsen, 2015; Love and Roper, 2015; Dooley and O'Sullivan, 2018), this fails to accurately measure innovation in LMT SMEs since, with little to no investment in R&D, these firms often engage in innovation activity and continue to survive and grow. This suggests that LMT SMEs may have alternative capabilities to innovate in the absence of R&D. Hence, R&D intensity levels are an unsuitable measure of the innovation activity of LMT SMEs. Therefore, in addressing the central research question, this research strives to contribute to innovation literature for both theory and policymakers, by gaining an understanding of the types of innovation, the process and nature by which innovation is managed and the capabilities that underpin LMT SMEs survival and growth.

In addressing the first research question, *"Do LMT SMEs innovate to facilitate survival and growth?"*, the research confirms that LMT SMEs (in the food sector) do innovate. Our findings suggest that LMT SMEs innovate in ways different from the accepted norm. Process innovation is

central to the types of innovation activities of LMT SMEs by improving firm productivity, improving product quality and reducing firm costs. (Reichstein and Salter, 2006). This aligns with previous research by Hervas-Oliver et al. (2011) and Santamaria (2012) that stress process innovation importance for LMT SMEs and emphasise the need for greater research of process innovation management in its own right.

Product and position innovation is also prevalent but deemed of lesser importance for sustainability in competitive landscapes than process innovation impacts. Product and position innovation impact on LMT SMEs is related to growth, the opportunity to target new markets and ensuring firms adapt to emerging trends and opportunities. This is supported by Dooley and Som (2018) and Robertson et al. (2009) and stresses the need for greater research of position innovation, due to its dominant internationalisation focus for LMT SMEs. Further, LMT SMEs to a significantly lesser extent engaged in paradigm innovation, perhaps related to the LMT SME constraints, scale and relative power within the ecosystem. Despite this, when examining the overall level of innovation ongoing, the research highlights ongoing efforts of multiple projects driving LMT SME survival and growth.

The novelty of LMT SMEs innovation activity highlights that these firms largely engage in innovations that are incremental across all types of innovation, reflecting the risk-averse, conservative nature and resource-constrains of LMT SMEs. This dominant focus on incremental innovation activity is largely supported in research by Love and Roper (2015) and Hervas-Oliver et al. (2011). This study stresses a greater need for research into the incremental and radical innovation spectrum of LMT SMEs to further understand the little to no engagement in radical

innovation activity. This research found that the tendency towards incremental innovation was viewed as prudent to the context of LMT SMEs and risk management to maintain the sustainability of the firm. Additionally, resource constraints limit both the quantity and scope of actions undertaken. While this reliance on incremental innovation efforts reduces the degree of growth for the firm, it supports LMT SMEs survival and growth. It is these characteristics that limit firm engagement with the other types of innovation including position and paradigm innovation. Thus, engagement in innovation activity is largely exploitative rather than exploratory given LMT SMEs depend on suppliers of machinery and have limited resources and internal knowledge. This highlights the limited strategic orientation of LMT SMEs found in this study as these firms are largely reactive in terms of their innovation management rather than proactive.

The second research question aims to explore the nature of *"How do LMT SMEs manage their innovation activity?"*. In addressing this research question, we highlight the differences in how LMT SMEs manage their innovation activity in comparison to the accepted norm. Our findings suggest that LMT SMEs have unstructured, implicit and ad-hoc approaches to innovation management, yet the management team implicitly oversee, understand and manage the four phases, some better than others. The innovation process is characterised by the informal and fluid decision making of the owner and management team which stimulates and encourages an innovative culture. The organisation's innovation trajectory is therefore significantly influenced by the beliefs and perspectives of these individuals. Thus, the existence of an emergent approach to innovation management in LMT SMEs was found rather than a positional planned approach. The research highlights the novelty of this innovation management style, given formal innovation processes are more widely regarded as best practice (Kahn et al., 2006; Barczak et al., 2009;

Prakash and Gupta, 2008; Terziovski, 2010; Hervas-Oliver, 2011; Tidd and Bessant, 2018). Yet, these differences exist given explicit phases conflict with the entrepreneurial process of the founder and the need for agility. Therefore, LMT SMEs have overcome the negative consequences associated with implicit innovation management through their selection of limited and short term projects, the DUI mode of innovation, and a reactive rather than proactive approach to innovation management (Miner, Bassoff, and Moorman, 2001) This aligns with previous research of Hullova et al., 2019 and Som, Kirner and Jager, 2015 and builds a deeper qualitative understanding of the innovation management process that allows LMT SMEs innovate for survival and growth.

The third research question seeks to understand "*What capabilities underpin LMT SMEs ability to innovate to facilitate survival and growth?".* Firstly, given LMT SMEs by definition have no or a low R&D intensity, the absorptive capacity of these firms is often overlooked in terms of market knowledge and process technical knowledge. Their ability to identify, access and assimilate knowledge through collaborations external to the firm is often considered a weakness (Cohen and Levinthal, 1990; Mowery et al., 1996; Vega-Jurado et al., 2008; Hervas-Oliver et al., 2011). However, this research builds on the work of Rammer et al. (2009), Huang et al. (2010) and Barge-Gil, (2010) by supporting their findings that LMT firms achieve innovation success through external knowledge acquisition and collaborations with external organisations. Therefore, the novelty of LMT SME context from an innovation research perspective is reflected in the often informal (Nouman et al, 2011) and non-equity form of collaboration (Klevorick et al., 1995; Lee et al., 2001; Hervas-Oliver et al., 2011). The development and exercise of this capability is perhaps due to the limited resources that characterise LMT SMEs as it allows these firms share resources across boundaries providing the opportunity to reduce firm resource constraints (Mohr and

Spekman, 1994; Propris, 2000; Hoffman and Schlosser, 2001; van de Vrande et al., 2009; Hervas-Oliver et al., 2011), leading to advantages most often associated with large organisations (Nooteboom, 1994; Maskell, 2001; Døving and Gooderham 2008; Nieto and Santamaria, 2010).

Secondly, the market orientation and understanding of LMT SMEs is central to their innovation activity (Earle, 1997; Grunert et al. 1997; Borch & Forsman, 2000), in particular, product and process innovations (Le Bars et al., 1998). LMT SMEs interface between the market and production allows the firm experiment and innovate in an agile manner. It is this novel capability that allows LMT SMEs innovate in different ways to improve the firm's opportunity to survive and grow in the face of insurmountable challenges. These marketing capabilities are frequently exercised as innovation in LMT SMEs is driven by customer-focused and practical knowledge (Hirsch-Kreinsen, 2004; Tunzelmann and Acha, 2005; Hirsch-Kreinsen, 2008; Heidenreich, 2009). The importance of marketing capabilities is reflected in the influence this capability has over other organisational capabilities (Su et al., 2013). This aligns with previous research by Hirsch-Kreinsen, 2015 and Wu, 2013 that stress the importance of SMEs marketing orientation and emphasises the need for greater research on firm marketing capabilities in its own right.

Thirdly, the entrepreneurial orientation of LMT SMEs and hence the centrality of the entrepreneur and upper-level management team is of considerable importance due to their ability to guide the organisation and its innovation trajectory. The entrepreneurial orientation of LMT SMEs is widely considered implicit as the strategies of these firms are emergent and embedded in the entrepreneur's tacit knowledge. This facilitates flexibility to pursue emergent opportunities, unattainable for large firms, leading to a competitive advantage that allows SMEs to survive and

grow in the face of challenges. This novel capability, from an innovation research perspective, distinguishes how LMT SMEs innovate given the leaders of these firms are central to innovation management as they provide direction, inspiration and the support necessary for innovation activity. This aligns with the research of Dooley and O'Sullivan, 2018 and Hirsch-Kreinsen, 2015 that highlight the importance of LMT SMEs entrepreneurs and builds our understanding of their influence.

Lastly, LMT SMEs depend on learning capabilities defined by the DUI mode of innovation through experience-based know-how (Albaladejo and Romijn, 2000). The implication for LMT SMEs is that they rely on tacit knowledge, characterised by incremental problem solving and a trial and error approach to innovation management (Albaladejo and Romijn, 2000), rather than the STI mode of innovation adopted by HT firms. This alternative approach to the learning mode of innovation, in part, separates the innovation activity of SMEs and large organisations given SMEs are forced to innovate in different ways than the accepted norm due to their wide range of resource constraints. Thus, this finding contributes to theory given that while it is not widely reflected in innovation management literature, R&D activity is not a key determinant of survival and growth (Cohen and Levinthal, 1990; Muscio, 2007; Hall et al., 2009; Rammer et al., 2009; Santamaria's et al. 2009).

6.1 Policy Implications of the Research

The implications of this research highlight how governments and policymakers should give more attention to non-R&D activities that contribute to innovation output and not just the level of R&D expenditure (Jacobson and Heanue, 2005; Godin, 2006) given the LMT classification is neglected

by this innovation assessment (Roper and Love, 2002; Hirsch-Kreinsen et al., 2005: Hirsch-Kreinsen, 2008) yet is highly dominant in both developed and developing economies (Sandven et al., 2005). This research proposes three areas of focus for policymakers to support the survival and growth of LMT SMEs. Firstly, policymakers should give more attention to capability development, given our findings suggest that LMT SMEs capabilities contribute significantly to innovation output, through policies that enhance management capabilities and support collaborations by providing greater exposure to a wider network of collaborators.

Secondly, policymakers should provide education, training and mentoring support for SME managers. Our findings suggest that as the organisation grows, the influence of the entrepreneurial MD is diluted given one person can't maintain oversight of increased innovation activity. Thus, SME managers should have the necessary training and mentoring to support firm survival and growth by engaging in proactive, explorative and strategic actions rather than their current state that is reactive to and exploitative of emerging opportunities.

Lastly, greater attention is required to support LMT SMEs engagement in position innovation given its relatively low adoption compared with process and product innovation. Our findings suggest that LMT SMEs engagement in position innovation has been primarily towards internationalisation, then it is necessary to acknowledge the BREXIT impact, given the importance of this market for the majority of Irish LMT SMEs. Initiatives to provide support in overcoming emerging barriers to UK trade and support in opening new export markets could nurture greater innovation.

6.2 Limitations of the Study

In this study, three main limitations exist which relate to data collection. Firstly, the primary data is collected from a case study research approach which can sometimes be criticized for *'researcher bias'* and lack of objectivity (Amaratunga and Baldry, 2001; Becker, 2008; Seuring, 2008). To prevent this limitation, multiple case studies were used with specific common criteria that firms must fit, primary data was triangulated with secondary desk research to ensure accuracy, an interview protocol was developed to guide the researcher and by a sample validation by the research supervisors of the coding process to ensure consistency, independence and triangulation.

Secondly, access constraints for case study research was an issue given geographical limitations and availability to key informants was limited. To overcome the access challenge, regional SMEs were targeted and time was spent engaging with targeted interviewees to explain the importance and build the relationship necessary to secure their participation.

Thirdly, this study is solely focused on a small sample of targeted 'innovative' SMEs in the LMT food sector, which despite representing a significant percentage of LMT SMEs in the Irish context, excludes other LMT sectors such as plastics, textiles, and metal fabrication, which are often less business to customer (B2C) in nature. Thus, future research of wider samples may highlight greater differences.

6.3 Recommendations for Future Research

Ample scope for further research exists on the innovation management of LMT SMEs to build on the exploratory findings of this research. In particular, a large-scale quantitative study could be

designed to determine more accurately to what extent the findings of this case study are generalisable to LMT SMEs. Additionally, this exploratory case study could be replicated in several other LMT SMEs across Europe to build a deeper qualitative understanding of how LMT SMEs innovate for survival and growth.

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8 APPENDIX

8.1 Appendix I: ETHICS APPROVAL FORM

UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh	**ETHICS APPROVAL FORM** **Social Research Ethics Committee (SREC)** ✉ srec@ucc.ie

Introduction

UCC academic staff and postgraduate research students who are seeking ethical approval should complete this approval form. Ethical review by the Social Research Ethics Committee (SREC)[1] is required where the methodology is not clinical or therapeutic in nature and proposes to involve:

- direct interaction with human participants for the purpose of data collection using research methods such as questionnaires, interviews, observations, focus groups etc.;
- indirect observation with human participants for example using observation, web surveys etc.;
- access to, or utilisation of, anonymised datasets;
- access to, or utilisation of, data concerning identifiable individuals.

SREC @ UCC considers itself an enabling committee, promoting strong research ethics amongst UCC's community of staff and student researchers. We are open to all types of research in the social research domain and if your research approach does not readily fit into this research form, do not be discouraged. Please add additional relevant notes to convey what you think is pertinent about the ethical aspects of your study.

Application Checklist

This checklist includes all of the items that are required for an application to be deemed complete. In the event that any of these are not present, the application will be returned to the applicant ***without*** having been sent for review. Please ensure that your application includes all of these prior to submission. Thank you and best of luck with your research.

All relevant files are combined into **one PDF** file (SREC application form, consent forms, information sheets, data collection instruments, permission letters, etc.)	Yes
Completed SREC Application Form	Yes

[1] SREC is a committee of the University Ethics Committee. If you are unsure which University ethics committee you should apply to, please consult this resource: https://www.ucc.ie/en/research/ethics/. Acknowledgement: An early version of this form was adapted from pp. 13-14 of the *Guidelines for Minimum Standards of Ethical Approval in Psychological Research* (British Psychological Society, July, 2004)

Information Sheet(s) / Information Statement (i.e. at the beginning of an electronic survey) included	Yes
Consent Sheet(s) / Consent Statement (i.e. at the beginning of an electronic survey) included	Yes
Data Collection Instrument: Psychometric Instruments / Interview Guide / Focus Group Schedule / Survey Questionnaire / etc. included	Yes
Copy of permission letters to undertake research from relevant agencies/services included (if available)	No
If you are under academic supervision, your supervisor(s) have approved the wording of and co-signed this application prior to submission	Yes
If this is a resubmission, all the revised and new text is highlighted in yellow	N/A

APPLICANT(S) DETAILS

Name of UCC applicant(s)	Evan Collins	**Date**	09/03/18
Department / School / Research Institute / Centre / Unit / College	Department of Management and Marketing, University College Cork	**Contact No.**	(087) 1302771
Correspondence Address	Quarry Road, Drimoleague, Co. Cork, Ireland	**Email Address**	113387856@umail.ucc.ie
Name and year of course (students only)	MSc by Research (Management and Marketing)	**Name of supervisor(s)** (students only)	Prof. Mary McCarthy Dr. Lawrence Dooley Dr. Seamus O'Reilly
Is this a resubmission?	No	SREC Log No. (if known):	
What type of SREC approval are you seeking?[2]	Full approval ☒	Outline approval ☐	Funding approval ☐

Obtaining ethical approval from SREC does not free you from securing permissions and approvals from other institutional decision-makers and agency ethical review bodies. These bodies may accept the SREC approval, but researchers are responsible for ensuring they are compliant in advance of collecting data.

Project working title	Exploring the capabilities that underpin innovation within Low and Medium Technology SMEs in the food sector.

[2] *Full approval* is required for study design, data collection *and* data analysis. *Outline approval* is for activities such as early-stage research design and participatory processes where there is *no* data collection at this time. For *outline* approvals, a further application will be necessary should there be a subsequent data collection phase. *Funding approval* should be ticked if your funding grant requires approval within a short time frame (e.g. 2 months).

If this is a collaborative project / community-based participatory research project / *joint* application with another agency, please complete this additional section:

Names of research partners / civil society organisations collaborating on this project (this section must be completed for participatory / community-based participatory research studies)	N/A
Agency contact person and position	N/A
Agency address	N/A
Details of the partnership (roles, type of partnership, etc.)	N/A

ETHICAL APPROVAL SELF-EVALUATION

If your answer falls into any of the shaded boxes below, please address each point later on in the application form

		YES	NO
1	Do you consider that this project has significant ethical implications?		NO
2	Will you describe the main research procedures to participants in advance, so that they are informed about what to expect?	YES	
3	Will participation be voluntary?	YES	
4	Will you obtain informed consent in writing from participants?	YES	
5	Will you tell participants that they may withdraw from the research at any time and for any reason, and (where relevant) omit questionnaire items / questions to which they do not wish to respond?	YES	
6	Will data be treated with full confidentiality / anonymity (as appropriate)?	YES	
7	Will data be securely held for a minimum period of ten years after the completion of a research project, in line with the University's *Code of Research Conduct* (2016)?	YES	
8	If results are published, will anonymity be maintained and participants not identified? (see Q. 30 below regarding open data considerations, if relevant)	YES	
9	Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)?	YES	
10	Will your project involve deliberately misleading participants in any way?		NO
11	Will your participants include children / young persons (under 18 years of age)?		NO
12	If yes to question 11, is your research informed by the UCC *Child Protection Policy*? http://www.ucc.ie/en/ocla/policy/		NO
13	Will your project require you to carry out "relevant work" as defined in the National Vetting Bureau (Children and Vulnerable Persons) Acts 2012 to 2016?[3]		NO

[3] Relevant work constitutes any work or activity which is carried out by a person, a necessary and regular part of which consists mainly of the person having access to, or contact with, children or vulnerable adults.

14	Do you require official Garda Vetting through UCC before collecting data from children or vulnerable adults?[4]		NO
15	Will your participants include people with learning or communication difficulties?		NO
16	Will your participants include patients / service users / clients?		NO
17	Will your participants include people in custody?		NO
18	Will your participants include people engaged in illegal activities (e.g. drug taking, illegal Internet behaviour, crime, etc.)?		NO
19a	Is there a realistic risk of participants experiencing either physical or psychological distress?		NO
19b	Is there a realistic risk of the researcher experiencing either physical or psychological distress?		NO
20	If yes to question 19a, has a proposed procedure for linking the participants to an appropriate support, including the name of a contact person, been given? (see Q. 33)	N/A	
21	If yes to question 19b, has a proposed procedure/support structure been identified?	N/A	
22	Are your research participants students with whom you have some current/previous connection (module coordinator, research supervisor, professional tutor, etc.)?		NO
23	Will your study participants receive payment / gifts / voucher / etc. for participating in this study?		NO

[4] It is not an official requirement of the National Vetting Bureau (Children and Vulnerable Persons) Acts 2012 to 2016 for researchers to be Garda Vetted to undertake research with children and vulnerable persons for *once off* contact, other than where it includes activities such as coaching, mentoring, counselling, teaching or training of children or vulnerable persons. Some gatekeepers and funders may require researchers to have a valid Garda vetting before data collection can begin even for once off contact. For researchers planning for ongoing data collection with children and vulnerable persons or where contact may be unsupervised, Garda vetting is likely to be required. Researchers should follow the advice in the *UCC Child Protection Policy* and the UCC Garda Vetting guidelines (links at the end of this document).

DESCRIPTION OF THE PROJECT

*Ethical review requires that you **reflect** and seek to **anticipate** ethical issues that may arise, rather than reproduce copious text from existing research proposals into these boxes. Entries should be **concise** and relevant to the point / question.*

24. Very brief description of your study (15-25 words max.)
[i.e. This is a qualitative study of primary school teachers' attitudes towards religious teaching using focus groups to collect original data]

This is a qualitative study to explore the capabilities that underpin innovation within Low and Medium Technology (LMT) small and medium enterprises (SMEs) within the food sector.

25. What is your study about? (100-200 words max.)

The study aims to explore the capabilities and practices that support innovation of LMT SMEs within the food sector. Organisations within the LMT classification are chosen as the focus of this study since research and development (R&D) is not (by definition of the industry category) a core determinant of how these firms innovate. Existing innovation management literature highlights the importance of this R&D determinant for firm sustainability yet these LMT SMEs, with little to no investment in R&D, often have long life cycles, indicating capability to innovate without R&D. This research aims to contribute to the existing literature by better understanding the perceptions and practices of senior management of LMT SMEs when developing the business. These findings will provide a better understanding of how non R&D intensive LMT SMEs nurture organisation innovation.

26. What are your research questions?

The overall aim of the research is to explore the capabilities and practices that underpin innovation of Low and Medium Technology SMEs within the food sector. The following research questions will address LMT SMEs within the food sector:

1. What type(s) of innovation is undertaken by LMT SME food sector firms to facilitate growth?
2. How do these LMT SME food sector firms go about achieving innovation?
3. What capabilities underpin LMT SME food sector firm's innovation efforts?

27. Brief description and justification of methods and measures to be used (attach questionnaire / interview protocol / discussion guide / etc. for **full** SREC approval. **Not** required for SREC outline approval)

This research employs a qualitative case based approach (Stake, 1995; Yin, 2003), and was deemed appropriate due to the lack of prior research in this area and its ability to explore relationships (Eisenhardt, 1989; Yin, 2003). The methods and measures used in this research study to gather data include three methods of data collection:
A: Publically available secondary data collected through desk research;
B: Qualitative, semi structured interviews;
C: Private secondary data collected from the interview participants as part of the interview process.

A. Secondary data collected through desk research.

The intention is to collect secondary data prior the semi-structured interviews. This will involve conducting desk research, collecting data from publicly available sources. This data will be collected to help inform the researcher of the intricate

details of the interview participants. Further, this will allow for the triangulation of primary data gathered from the company interviews. The justification for using multiple data sources is to enhance the data credibility (Yin, 2003), allowing for similarities and differences between cases to emerge.

B. In-depth, Semi-Structured Interviews

Critical individuals will be selected for the in-depth, semi structured interviews. The interview participant's strategic beliefs and perceptions of reality form their firm's innovation practices and strategic trajectory (Green, 1992). Therefore, the interview participants own views and interpretations play an important role in this approach. This is further justified in [Section 28. Participants]. Additionally, it is likely that participants will wish to tell their company's story in their own way. Consequently, flexibility is required, something facilitated by the semi-structure nature of the interview protocol (Appendix A). However, it must be considered that some structure is equally important and thus the interview protocol (Appendix A) ensures the discussion stays on track.

Qualitative research provides a comprehensive understanding of the interviewee's perceptions and seeks insights into something not yet entirely understood rather than statistical or numerical perceptions derived from quantitative research, (Bell, 2005. p. 7) as is the case in the current study. To gain the required insight, semi-structured, one-to-one interviews will be used to give the interviewer the opportunity to probe answers and have each participant explain how they nurture innovation within their firm and elaborate on their responses.

Cooper and Schindler (2008) clearly highlight that interview informants should have the right to decline to respond to any question due to the importance of voluntary participation. This will be taken into account in the consent forms (Appendix C1, C2) and will therefore make clear the voluntary participation among participants. Consent form (C1) is designed for the Managing Director of the firm. Consent form (C2) is designed for employees of the firm. The nature and focus of the questions asked is considered in great detail to ensure the researcher avoids asking unnecessary and inappropriate questions (Sekaran and Bougie, 2009).

Semi-structured interviews will be guided by an interview protocol (Appendix A) that has been distilled from a preceding literature review of the innovation management and SME literature. The literature review was performed for developing the theoretical foundation for this thesis. All of these interviews are expected to take place face to face between May 2018 and June 2018. The interview protocol (Appendix A) provides the structure and framework necessary to guide the flow of the interview. The interview protocol is divided into seven sections. Each set of question are designed to facilitate deeper exploration of this particular dimension and enhance our understanding of how LMT SMEs innovate.

C. Private, secondary data collected from the interview participants.

In the process of undertaking the interviews, it is envisioned that in certain cases firm specific, supporting documentation may be given by the interviewee to support the discussion. In such instances this data will be used to triangulate against other data sources e.g., interview transcripts and secondary data and will be maintained in a secure and confidential manner as outlined in [Section 30. B].

28. Participants (recruitment methods, number, age, gender, exclusion/inclusion criteria, detail permissions to be sought / secured already)

The potential interview participants for this study will be drawn from food LMT SMEs in the Munster region. The list of potential respondents was built using various publicly available databases from different sources including Enterprise Ireland, Bord Bia, Supervalu Food Academy Directory, Tesco Taste Bud Directory, Irish Times Top 1000, Good Food Ireland, and other articles from the Irish Times and Irish Examiner. After an analysis of these databases of SME firms, a more refined list was developed reflective of the category criteria necessary to consider a SME as a potential interviewee. Failure to meet any of these requirements will eliminate any potential interviewee from participating in the study. The selection criteria for this study includes participants who represent firms that:

1. Employ between 20 – 80 staff members.
2. Have headquarters established in the Munster Region (due to geographical limitations.)
3. Have a total revenue of between €5,000,000 -€20,000,000 per annum.
4. Have been established for greater than 5 years, and less than 100 years.

5. Operate in both National and International Markets.
6. Manufacture or package their own products on their own premises.

Within these companies the target interviewees are the general manager/owner, and at least one member of the upper level management team, nominated by the general manager/owner. Selection of this cohort of individual is necessary since such individuals possess a holistic perspective of how innovation within the firm is achieved. These upper level managers are *"considered to be influential, prominent, and and/or well informed in an organisation or community; they are selected for interviews on the basis of their experience in areas relevant to the research"* (Marshall and Rossman, 2006, p.155). Undertaking multiple individual interviews within each case allows the triangulation of the information received to ensure the reliability of the research and to counteract individual bias.

Subject to ethical approval, the intention is to secure 7-10 companies from the potential interview list. To this end, potential case firms will be written to by letter (Appendix B1) in order to request participation in the research. This letter will provide potential interviewees with a description of the research objectives and overview of the intended research process. The letter will also reassure the individuals that the researcher will not divulge any information without the prior written permission of the participant. Finally, a statement that the researcher will call by telephone to the recipient to 'follow up' approximately a week after the letter has been posted.

As described above, this letter will be followed by a telephone call to the potential interview participant within a week of the letter being posted. This call is expected to be vital in securing access to the potential interview respondents, building rapport and trust, and also answering any questions the potential research participant may have. Once permission is granted by the informant they will be asked to sign a voluntary consent form. This consent form is further described below. For the purpose of this research study, two consent forms have been drafted (Appendix C1, C2). The first consent form (Appendix C1: Owner / Manager Consent Form) attached is specific to the owner / manager of the firm. This consent form requests consent for their own participation in the research study while also outlining a request to consent for at least one of their upper level management employees of their choosing, to participate in the research study. The second consent form (Appendix C: Upper level management) is specific to upper level management employees, to request their consent for participation in the research study. Therefore, the consent granted by each company protects the owner / manager, their company, and their employees.

29. Concise statement of *anticipated* ethical issues raised by your project. How do you intend to deal with them? Please address *all* items where your answers fell into a shaded box in the self-evaluation above. (350 words max.)

The anticipated ethical issues raised by this project are outlined as follows:

- Companies that nominate to participate in the research will have their identity protected to ensure sensitive data does not make it into the public domain and damage their competitive position. To this end, the companies and interviewees transcripts will be anonymised using pseudonyms. These transcripts will be reviewed by the research supervisors and emailed to the respective interview participants using password-protected files to ensure security. These digital transcripts will be stored securely on a NAS file (1) in a secure location on UCC premises (See section 30B). It should be made clear that anonymity does not just mean changing the participants' names but means that all identifying information in the data will be anonymised and de-identified (e.g., place names, employing organisations, specific job title if only one person does that role and so on).

- Secondary, publically available, desk research will also be collected on these participants. Similarly, this data will be anonymised using pseudonyms and will therefore remain confidential, as any identifiers will be disguised.

- All data gathered from the semi-structured interviews will be recorded on an audio recording device. These recordings will be downloaded onto a secure, separate NAS file (2) and will then be deleted from the recording device. This NAS file (2) will ensure the recordings remain confidential.

- In the event of being handed any private company documents that identify the interviewee or the company during the interview or during any other correspondence, the information will be stored separately in a locked filing cabinet by Dr. Lawrence Dooley on UCC premise in a locked office. These documents could include private company reports not available to the public. The nature of these documents makes it impossible to disguise the information using pseudonyms.

- Further, it is important to note the participant's ability to withdraw any or all information they deem necessary up to two weeks after the interview process. This provides the interview participant an opportunity to reflect on the data they provided.

- Finally, interview participants will be provided with a full transcript for approval after the interview has been conducted to all participants are satisfied with their answers.

30. Data:
(a) What type of data will you be storing?
(b) How and where will you store your data?[5] (provide details for both physical ***and*** electronic documents). [6]
(c) For how long will you store the data? (A minimum storage period of 10 years is required)
(d) Who will have access to the dataset? (*Sample* prompts: If you plan to make your raw research dataset available publicly as part of the open data movement, please address your protocol here. For collaborative/community-based participatory research, please address issues such as shared ownership of data, publication of findings, etc. If your funder contractually requires you to give them access to the 'raw' dataset, examine relevant implications, including appropriate anonymisation, protocols for secure access to the dataset, etc.).
(e) If you are planning to analyse an existing dataset, please outline how the original consent process allows for your analysis.

(A). The type of data collected and stored includes:

- Publicly available secondary data.
  This data will help inform the researcher about the company and interview participants. It will also allow for the triangulation of primary data gathered from the company interviews.

- Audio recordings.
  These will be collected to allow for accurate transcripts of the interviews.

- Interview transcripts.
  The interview transcripts will be anonymised using pseudonyms and will be used for analysis to ensure to break any link and ensure a complete disconnection between the respondent and the profile for those outside the research team. Nevertheless, where these personal identifiers exist, the original and anonymised data will be

[5] Data management should follow the FAIR guiding principles (Findability, Accessibility, Interoperability & Reusability). See, for example, Wilkinson, M. D. *et al*. (2016) *The FAIR Guiding Principles for Scientific Data Management and Stewardship*. Full text: http://www.nature.com/articles/sdata201618.

[6] It is required that all staff and student researchers store those data which are required to replicate research findings, and the information required to enable re-use of data. Details of the UCC policy on research data storage can be found in section 8 of the *Code of Research Conduct* (2016): https://www.ucc.ie/en/media/research/researchatucc/documents/UCCCodeofResearchConduct.pdf. UCC's staff IT service can assist with encrypting staff laptop/desktop computers (see http://www.ucc.ie/en/it/services/encryptionlaptop/) and with providing storage space on a secure Network Attached Server for your data (UCC staff only - see http://www.ucc.ie/en/it/services/networkfilestorenas/). SREC advises against storing research data on cloud-based storage services.

stored securely to protect the documents from unauthorised access. Particular care will be exercised when storing data, further discussed in part B.

- Private company documents.
  These include documents that may be used by the interview participants to support their discussion as part of the interview process. Due to the nature of these documents, they cannot be disguised. They will therefore be stored separately as described in the following section B.

(B). All data collected will be stored on both physical and electronic documents.

- The audio files and digital interview transcripts will be held securely and separately on two NAS files, which will be held on a secure server on University College Cork premises. A NAS file (Network Attached Storage) is a dedicated and secured centralise server storage device that will be accessible by the research team only. The members of this team are outlined above. NAS File (1) contains the digital transcripts of the interviews, while NAS file (2) contains the audio recordings from the interviews.

- Dr. Lawrence Dooley will store the physical documents securely and separately in a locked filing cabinet, in his locked office on UCC premises. The first file will contain hard copy files including anonymised, publically available secondary data and consent forms.

- Secondary private company documents containing confidential and personal data that may be collected as part of the interview process, will also be held securely and in a separate locked filing cabinet, in locked office on UCC premises. These documents must be stored separately due to the researcher's inability to disguise these documents.

- A master document containing participant identifiers, linking the anonymised digital files with the hard copy secondary data will be developed and stored in a separate file by Dr. Lawrence Dooley in a filing cabinet in a secure office.

(C). In line with research integrity best practice, the data will be securely held for a minimum of ten years after the completion of the research project. Following this period, the data will be destroyed, paper documents will be shredded, and computer files and other digital material will be permanently deleted. The management of data in this secure and thoughtful manner illustrates how the ethical concerns that currently exist will remain beyond the end of the research study in order to continue to maintain the confidentiality and anonymity of the data collected, the anonymity of participants, their privacy and to ensure that harm is not caused to participants.

(D). Investigator, supervisors as outlined above and examiners of the research output.

(E). N/A

31. Arrangements for informing participants about the nature of the study (cf. Question 3)

Subject to ethical approval being received, participants will be informed of the nature of the study in the following ways:

- Participants will be written to by post (Appendix B1), requesting their participation in the interview.

- Following this letter, and within a week, a call will be made to each potential interview candidate for follow up discussion. Respondents will be reassured of the confidentiality of all data and all information specific to any organisation. Once companies have agreed to participate in the interview, they will once again be informed that they have the right to withdraw from the process and not have their input included in the research at any stage of the interview. The voluntary participation in the interview will be made clear to each participant.

- If they agree to participate, an information sheet (Appendix B2) informing the participants of the nature of the research will be sent by email. This document includes details about the requirements and implications of taking part, participant's rights, how their data will be reported, how data will be stored and who to contact in case of concerns.

- They will then be asked to sign a consent form (Appendix C1, C2) as part of the process, prior to the interview process. This consent form is further described in [Section 32].

32. How you will obtain Informed Consent? (cf. Question 4 - attach relevant form(s))

As described by the literature, *"informed consent involves participants being given sufficient information, the opportunity to ask questions, time to consider without any pressure or coercion, to be able to reach a fully informed, considered, and freely given decision about whether or not to take part."* (Saunders et al., 2009, p. 238).

- Contact will be made with potential participants via letter (Appendix B1) by post. At this stage, the basic procedures of the project, and what the study involves will be outlined briefly.

- Further to this, informed consent will be obtained using the attached consent form (Appendix C1 and C2) from those who agree to participate in this research study on a voluntary basis after the purpose and nature of the research has been explained in writing as per (Appendix B2). Before the commencement of the interview, both the researcher and participant will sign the consent form. This consent form will also include a request for permission to record the interview and will indicate that they can withdraw from the study, without repercussions, at any time, whether before the interview starts or while participating, and up until two weeks after the interview takes place in keeping with best practice as outlined in the literature. It will also be made clear that anonymity will be ensured in the research output through disguised extracts from the interview and the identity of the case study companies. The use of the written consent form helps to clarify the boundaries of consent as the research involves the collection of confidential, personal and company data.

- After the interview is conducted, interview transcripts will be disguised using pseudonyms. The participants will then be sent their own interview transcript in a secure, password-protected file. They will have an opportunity to review the transcript to ensure the transcript is accurate. They will also have the opportunity to make any amendments they deem relevant. An email reply will be sufficient to ensure informed consent has been received, provided the participant makes no amendments. Any amendments will be made over the phone between the researcher and the interview participant.

33. Outline of debriefing process (cf. Question 9). If you answered YES to Questions 19a or 19b, give details here. State what you will advise participants to do if they should experience problems (e.g. who to contact for help).

N/A

34. Estimated start date and duration of project

The research began on the 01/October/2017. Up to this point the research has been desk based. A review of the literature has been conducted. Subject to ethical approval, the intention is to begin the fieldwork in May 2018, and to complete the same by the end of June to allow adequate time for data analysis critique and write up.
MSc by research - 12-18 months' duration in total.

35. Additional information of relevance to your application
N/A

36. Declarations	
I/we agree that should there be unexpected ethical issues arising during the course of this study, that I/we will utilise my/our professional/disciplinary code of ethics, and/or notify UCC SREC, where appropriate	Yes
I/we have consulted the UCC *Code of Research Conduct* (2016) and believe my/our proposal is in line with its requirements	Yes
I/we have consulted the UCC *Child Protection Policy* and believe my/our proposal is in line with its requirements	N/A

37. Signatures	
UCC Applicant(s)	**Academic Supervisor / Tutor / Principal Investigator** (where applicable)
Date: 23/ April/ 2018	Date: 23/April/ 2018

1. Please submit a *signed* copy this form and all relevant attachments **as one PDF file** to srec@ucc.ie. No hard copies are required.
2. SREC is not primarily concerned with methodological issues, but may comment on such issues in so far as they have ethical implications.

Website links and helpful resources

UCC *Child Protection Policy*	https://www.ucc.ie/en/media/support/ocla/policies/UCCChildProtectionPolicyFINAL.pdf
UCC *Code of Research Conduct*	https://www.ucc.ie/en/media/research/researchatucc/documents/UCCCodeofResearchConduct.pdf
Garda Vetting of UCC Staff	https://www.ucc.ie/en/hr/gardavetting/
UCC Student Vetting Policy	https://www.ucc.ie/en/media/studyatucc/undergrads/downloadabledocumentssection/StudentVettingPolicyandProcedure.pdf
IT Support for UCC Researchers	http://www.ucc.ie/en/it/services/research/
EU Commission, Responsible Research and Innovation & H2020 RRI Tools Website	https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation http://www.rri-tools.eu /
Irish Qualitative Data Archive (IQDA)	https://www.maynoothuniversity.ie/social-sciences-institute/research/iqda
Irish Social Science Data Archive (quantitative datasets)	http://www.ucd.ie/issda/

Electronic data storage

UCC NAS (Network-Attached Storage)	http://www.ucc.ie/en/it/services/networkfilestorenas/
UCC Device Encryption Service	http://www.ucc.ie/en/it/services/encryptionlaptop/
UCC Staff IT Services	http://www.ucc.ie/en/it/services/staff/
HEAnet FileSender	http://www.heanet.ie/services/hosting/filesender

8.2 Appendix II: INTERVIEW PROTOCOL

1. **Section One: Background of Interviewee / Company**
    a. Perhaps we could start by you telling me a little bit about the company
        i. (Products and services delivered)
        ii. (Growth over the years - employee numbers)
        iii. (Markets it serves? How has the market changed)?
    b. Can you give me a brief overview of your role in the company?
    c. Can you outline any major changes in the company's history?
        i. (New revenue streams, New Markets)

2. **Section Two: Competitive Advantage**
    a. Who do you consider to be your competitors and how are you different?
    b. Do you compare yourself to any other companies within or outside your industry?

3. **Section Three: Innovation**
    a. Everyone talks about innovation… what does that mean to you and is it important?
    b. Can you give me an example of a success story that improved the company's competitiveness?
    c. What other beneficial changes have you introduced?

4. **Section Four: Innovation Capabilities**
    a. What do you think has facilitated growth for your company?
    b. Can you think of anything that has inhibited or reduced your ability to grow?

5. **Section Five: Open Innovation / Collaboration**
    a. Do you work with any other people or organisations?
        i. (Internally, Externally)

ii. (Reciprocal, informal, financial exchange)
iii. Who else would you like to work with?

6. **Section Six: Research & Development**
    a. Do you ever avail of tax credits for R&D?
    b. Have you any IP, trademarks, or patents?
    c. As a % in turnover, how much do you approximately spend on R&D?

7. **Section Seven: Future**
    a. What does the future look like for this company?
    b. What capabilities or skills do you need to further develop and grow?
    c. When deciding on the direction the firm. Do you have a defined strategy? Or how does that happen here?
        i. Who's involved?

8.3 Appendix III: REQUEST INTERVIEW PARTICIPATION

Dear XYZ,

My name is Evan Collins. I am undertaking a Masters by Research in University College Cork to gain a better understanding of how SMEs within the food and drink based sector innovate and change in order to remain competitive in their markets.

I'm contacting you, as I'm interested in interviewing you to find out how your company has evolved over the past decade.

What the study involves.

Specifically, I'm interested in understanding what has both helped and hindered you in your attempts to introduce changes to the company that improved its competitive situation. It's apparent from my desk research that your company successfully innovates and so I'm interested in exploring, from your company's perspective, what leads to successful innovations.

This research would involve me talking to yourself and another relevant staff member that you nominate. University College Cork has a strict code of ethical research and data protection which guarantees your absolute and complete confidentiality if you choose to participate.

I will call you next week to discuss my research and address any questions you may have.

Please do not hesitate to contact (087) 1302771 if you need any further information:

If you agree to take part in the study, please sign the consent form overleaf.

Kind Regards,
Evan Collins
(087) 1302771.

8.4 Appendix IV: PARTICIPANT INFORMATION SHEET

Dear XYZ,

My name is Evan Collins. I am undertaking a Masters by Research in University College Cork to gain a better understanding of how SMEs within the food and drink based sector innovate and change in order to remain competitive in their markets.

What the study involves.

Specifically, I'm interested in understanding what has both helped and hindered you in your attempts to introduce changes to the company that improved its competitive situation. It's apparent from my desk research that your company successfully innovates and so I'm interested in exploring, from your company's perspective, what leads to successful innovations.

This research would involve me talking to the Managing Director and another relevant staff member. University College Cork has a strict code of ethical research and data protection which guarantees your absolute and complete confidentiality if you choose to participate.

What will happen to the information that you give the researcher

Your participation is completely voluntary. You have the opportunity to withdraw from the interview at any stage and also to withdraw from the study up to four weeks after the date of the interview. This is stipulated in the informed consent (you may keep a copy of this if necessary). Participants will be unidentifiable in the data, as all references made which may make them identifiable will be removed from the data during analysis.

The data will be kept confidential and available only to project researchers. Unique identifiers will be assigned to each participant interview and no reference will be made linking individuals and statements. On completion of the project, data will remain securely on UCC premises in a secure centralised server for a further ten years and then destroyed.

Your interview transcript will be returned to you and you will have the opportunity to amend if

necessary.

We do not anticipate any potential negative consequences for you in taking part. This study involves conversations and is interested in your experience of such events. While this reflects real-life situations, it is in no way meant to cause distress. On completing the interview, we can reflect on your experience of being interviewed and recap on the discussion.

Kind Regards,
Evan Collins
(087) 1302771

8.5 Appendix V: CONSENT FORM - MANAGING DIRECTOR

I……agree to participate in Evan Collins' research study.

I also agree to a member of the management team participating in this research study.

The purpose and nature of the study have been explained to me in writing.

I am participating voluntarily.

I give permission for my interview to be audio-recorded.

I understand that I can withdraw from the study, without repercussions, at any time, whether before it starts or while I am participating.

I understand that I will have the opportunity to review and make any amendments I deem fit after the interview transcript has been written up.

I understand that I can withdraw permission to use the data within two weeks of the interview, in which case the material will be deleted.

I understand that anonymity will be ensured in the write-up by disguising my identity.

I understand that disguised extracts from my interview may be quoted in the research output and any subsequent publications if I give permission below:

Signed: ……. Date: …….

PRINT NAME: …….

8.6 Appendix VI: CONSENT FORM - EMPLOYEE

I……agree to participate in Evan Collins' research study.

The purpose and nature of the study has been explained to me in writing.

I am participating voluntarily.

I give permission for my interview to be audio-recorded.

I understand that I can withdraw from the study, without repercussions, at any time, whether before it starts or while I am participating.

I understand that I will have the opportunity to review and make any amendments I deem fit after the interview transcript has been written up.

I understand that I can withdraw permission to use the data within two weeks of the interview, in which case the material will be deleted.

I understand that anonymity will be ensured in the write-up by disguising my identity.

I understand that disguised extracts from my interview may be quoted in the research output and any subsequent publications if I give permission below:

Signed: ……. Date: …….

PRINT NAME: …….

8.7 Appendix VII: INTERVIEW TRANSCRIPT - CASE ONE

ucc

Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

Interviewee Transcript: [redacted]

Date of Interview: 13th July 2018

Word Count: 22,700

Page Count: 61

Interviewee: [redacted] **- New Product Development Manager**

Interviewer:
00:00: Hello [redacted]. Thanks a million for participating. If you could just first outline a little bit about [redacted] and your role within the company as well.

Interviewee:
00:09: Ok. [redacted]is my name. I'm the New Product Development (NPD) manager here at [redacted]. I'm here with… just about the last six months. My role is to develop and enhance either existing product, process and also then to look at new products to be able to bring to the market.

Interviewer:
00:34: Ok. So talk to me about what you have done in the last six months that has been most effective. Where have you spent most of your time?

Interviewee:

00:45: I have worked a lot with the sales department. I suppose when you come into a business there is an existing pipeline of some description with launches so I picked up with that. We have brought to market now a grab and go range of products. An overnight oat type product with some raspberry and also a large - larger pack mango and passion fruit. Ideally targeting the food to go market. We would traditionally be deep retail which would be in the back end rather than necessarily at the front end of the express… of the whistle-stop stores and I suppose we wanted to try and get into that part of the market. That was one project. Another project I have worked on is a milk standardisation project which is bearing fruit. There would have been a lot of up and down… The nature of milk, it is seasonal. There is a variation in it. We are trying to standardise protein, trying to standardise fat in a more scientific way - so some protocols have been built. So I suppose that would have been in-house so nobody would see that from the outside but it has developed… I suppose a certain level of better consistency and that is where we are going with that.

Interviewer:

02:10: So can you go into detail about that project?

Interviewee:

02:15: Yeah sure. In relation to the milk standardisation. We have… fat and protein are effectively two attributes that we are trying to standardise for. In utilising the fat content, the fat gives a certain creaminess, texture, mouthfeel attribute. Once you get to a certain point of fat you don't perceive the extra creaminess or mouthfeel or texture. So it's a bit of a waste of money to be putting butterfat into a yoghurt product. We have looked at the manner in which we are getting test results. We are getting on a per load basis since about the last November… about four months ago now all those test results have gone online so there is an app that we are digging in to. What we are doing now is looking at the last three deliveries. So on a rolling basis… milk comes in this morning the test result does not come back to me for at least 24 to 48 hours. So I have to make a call on the milk we have now. So we are making a call on the basis of the level of fat we have seen in the last three deliveries. So it is either slightly rising, slightly falling and that will happen as per seasonality - They are out on the grass. This summer, in particular, has been difficult because cattle were in. They were being rationed. They were being fed early silage, they weren't being fed out on the

grass. It was a bit all over the place. Consequently, the milk quality was a little all over the place. The protein never strengthened this year. The general levels of protein levels in milk are quite low all this year even though the fat levels were at a reasonable level. For the fat standardisation, typically we are seeing 4% and above fat content. Anywhere between 4% and 4 ½ %. So we standardise… we reduce to 3 ½ % and we do that in one or two ways. Either skim the butterfat off - so we harvest some cream or we actually… at a certain level it becomes uneconomic. To separate it out we add water but what we do is add water with skimmed milk powder so we basically reconstituted skimmed milk powder to deliver the milk portion of that and that allows us to... The skimmed milk would have very little fat in it so on a balanced basis when you are coming from higher fat with a lower fat blended and we have it calculated out so it's a simple read off… the operator can do it. So when there is a delivery in, he can see… he has access to the last results, the last three results and he can then on the basis of the last three results read off how much milk he is taking in for what the fat level is and basically it's a straightforward drop-down to see how much skimmed milk powder and water or how much cream should be taken off that particular delivery. It all depends, I suppose there is a tipping point form a small business perspective in the cost of running the separator, the time involved for the individual to do it versus the value of the cream on delivery. On a small quantity of milk… say for instance today we are handling about 8,000 litres and that, relatively speaking would be a small quantity of milk. If we were to separate out some of the cream on that we would be running the separator for probably about six hours. The operator running that for six hours to get about 100 litres of cream. So to a certain degree that is not effective. The separator even for a much larger volume of milk would be running about the same length of time and it's to do with when we can do the CIP wash so the separator has to keep going otherwise it will seize and you have to strip it. It's a much more elaborate job and you would have half a dozen people around it for most of the day. So if we have a larger amount of milk the running cost of the separator doesn't increase and pro rata, it decreases because we have much more milk to put through it. So typically we would be looking at 26,000 to 30,000 litres then we would separate out the cream. We would harvest that so we could be harvesting several hundred litres of cream and at that point then it makes it economic to do it. That is on the butterfat side, on the protein side, typically protein is always lower than what we want. Protein gives us structure, it gives us the wherewithal to make the yogurt stiffer and firmer. So the likes of Greek yogurt would be quite high in protein. They would be quite firm - almost to the point that you are scooping it

out. You could nearly eat it with your fingers coming out it's so hard. In relation to the protein, we typically get protein in at about 3% to 3 ½% and we standardise that up to 4.6% and that is the starting point. So how we achieve that is we add extra skimmed milk powder and so skimmed milk powder is ⅓ protein. So on the basis of that we are adding it. It also contains lactose, it also contains a very small amount of butterfat and certain carbohydrates so it's a nice balanced product and gives us a textural aspect from the protein that we need in terms of the setup of the yogurt.

Interviewer:
08:30: Ok, very good.

Interviewee:
08:32: Sorry I know I went on a bit there but there are two aspects.

Interviewer:
08:37: No that is exactly what I need. Can you describe that product that ye have launched into the express stores?

Interviewee:
08:40: Ok. The grab and go products?

Interviewer:
08:44: Exactly.

Interviewee:
08:45: We are spelling that Grab'n'Go so grab n' go rather than and. Trying to be… maybe more niche or cool I don't know but it's… that is not actually on the pack but it's the range that we are describing to the retailers. They understand that concept rather than saying this is a front of shop concept. So what that is… the evolution of the overnight oat product and I know the likes of [redacted] have started with this. We have partnered to a certain degree with [redacted] for the oat content. They have their own overnight oat product but it is… But that is on a much more substantial oat quantity and allowing the oats to soak and absorb the moisture. We get a similar

feature for about a 5% oat content. We have a very mouthfeel product, very textured, quite like porridge to a degree yet it is still a yogurt. Also within that, we would identify that other seeds. So we have a five seed blend that we typically make in our natural yogurt in seeds so I use that as the base, add the oats and put it on top of a base layer of fruit, which for that particular launch we have raspberry. Equally, it could be strawberry, mango and passionfruit or any other of the number of fruits. In time suppose we… you always try to design a product that you can do a roll out against. So you have a common base which would be the oat and seeds and then you have the fruit changes giving you a potential range extension along that basis because maybe the flavour will work, maybe it won't and you need to be able to switch it up and do something. So it might be that it is a limited edition express product and that you do a limited edition in the raspberry and then you go on to a limited edition strawberry etc. Equally, it may be something you might target from a seasonal basis. For instance, you might do a blueberry one in and around June and July for 4th of July type American, you may look at ah, I suppose an orange version which you may release around Halloween. So there is a variety of you know clashes like that which might work quite well. We have looked at a number of the fruits and the team… on a team decision basis we went with the raspberry, which seemed to be a more midpoint on what basis have we done that? Purely on the taste and visual. But also on taste and visual versus the other product. You… typically if you launch a new range, you don't launch one. You try not to launch more than four because you confuse the market and from us… from our perspective, we are launching two because we are looking at that space and trying to get a little bit of that front of shop space. So the second product then is a larger version of our mango and passion fruit. So both the overnight oat and the mango are going to be a 200-gram finished weight. So that would be 20% fruit content. 80% non-fruit. So in the overnight, it's 80% of the seeds, natural yogurt and oats. And it is just natural yogurt on the mango side. But they complement each other. The mango is quite a bright, vivid yellow and the raspberry is the kind of ruby red and so they seem to contrast well on shelf. We in terms of looking at potential meal solutions… and that was on the other side of the process of the grab'n'go. We need to be much larger than our four pack or jar product because we are looking at this as a possible meal substitute. Healthier meal substitute. So the overnight oats being a breakfast type substitute and the mango perhaps being a lunch substitute. Equally then you could launch other flavours, textures or inclusions and you know there are a lot of other health benefits, you know particularly when we are looking at natural yogurt and turmeric with the antioxidants improvements that

turmeric would give as well as the bio digestive help that the nature yogurt will bring. The… I suppose the decision was to not complicate it too much. Keep it as close to the base product that we have on site because our typically bulk process is designed for yogurt production. So if I steer too far off that middle track, I'm then into specials. You're then talking about handling product in bins which then you have handling issues and hygiene issues there rather than handling it through the large bulk process where you can pump it directly from the tank into the packing unit and what I'm seeing on the basis of internal shelf life increases is that the products that have the least amount of 'handling' seem to last the longest.

Interviewer:
14:45: Ok.

Interviewee:
14:46: So take out the human interaction, you generate potentially 10%, 20%, even 30% longer shelf life. That is something… that is another project that I'm working on in parallel with all of the other things.

Interviewer:
15:00: Ok. I'll get to that. The first thing I'm going to ask is where exactly in store are these grab n'go located?

Interviewee:
15:09: They are going to be front of shop with your take away sandwiches, your bottle of drinks. So that targeted zone.

Interviewer:
15:15: Are they going to be refrigerated?

Interviewee:
15:17: Yes.

Interviewer:
15:18: Ok they are. Would it have been possible to make them non-refrigerated?

Interviewee:
15:22: No. Due to the perishable nature of the yogurt.

Interviewer:
15:26: Ye don't currently have any products that are not refrigerated?

Interviewee:
15:30: Correct. Oh well sorry, we have the cordials. Now the cordials are… traditionally they were refrigerated only. We have evolved that now in that the cordial is ready to drink so they can be… well the cordials now have about four months of history now on it. So the cordials now look like they are ambient stable up to the point of opening and it looks that potentially the ready to go or the ready to drink sorry, diluted versions of those cordials are also stable in ambient up to the point of opening so there is another client who has looked at taking substantial deliveries in one go of cordial but they need like 100 days' shelf life on delivery so they have it. I think it is a bit mad that they take a huge delivery looking for 100-day shelf life. They would be better off taking deliveries with 50-day shelf life or 75 which is kind of what we have at the moment but in order to get to the 100 days. Like it takes four months to get to the 100 days. I'm targeting 100 or 120 so that we will have a week or 10 days in house before we need to ship it and deliver it. So if we get an order on the 1st of the month for a delivery for the 20th of the month we have got that whole three weeks to make it and it will still… we could make it the following day… we could make it the next time and it will still be stable for 100 days after delivery. So that sorry, so that is an ambient product but everything is refrigerated.

Interviewer:
17:10: With the Grab n'go, what market are ye actually trying to target?

Interviewee:

17:15: It's the… its targeting I suppose the cross between potential food service type because we have had a lot of interest from foodservice distributors who service canteens. You know the likes of apple in cork and Microsoft in Dublin through the likes of Pallas foods. Pallas foods have been very excited about it but it's a matter of timing then to see when you can get those products launched.

Interviewer:
17:37: Sorry to interrupt. Do ye currently do any food service?

Interviewee:
17:40: Yes.

Interviewer:
17:41: What products?

Interviewee:
17:43: We do a range of butter, small jars, large pots and large buckets as well of between crème fresh, clotted cream and yogurts.

Interviewer:
17:53: Ok and do you see that as a potential growth area?

Interviewee:
18: 00: I… to a degree yes. We are kind of saturated in the existing range of products. Purely because we would have the feeling of an artisan producer although we may not necessarily have an artisan price. But there are cheaper products out there and if the product through the food service channel ends up on a consumer plate without branding, then there is no value in having our product. If it appears… one of the products we do with the butter is, we do these long sausages of butter roles of 500 grams and we give hotels or restaurants. If they are buying the food service type product than we give them a particular product, they get sheets of circular discs with [redacted] on them so what they can actually do is they slice butter and put it on a butter dish and put the [redacted]

little paper sticker, greaseproof on top of it so we have branding with the food service right up to point of view.

Interviewer:
19:06: Ok.

Interviewee:
19:08: Which then gives them more reason to be able to buy our product and charge for it because they can bring the branding through from a country butter perspective. So I think… does that answer your question?

Interviewer:
19: 20: Yes, it does. Talk to me a little bit about the partnership with [redacted]? How did that come about?

Interviewee:
19:27: Well I suppose I would have known [redacted] with the last 15-odd years from my time in [redacted] and also [redacted] who is the national sales manager. My wife actually by chance would have worked with her sister and I would have known [redacted] that length of time. So she is national sales manager so once we started talking outside. I engaged with the lads in [redacted]. I know [redacted] would know [redacted] as well over many years of different events and Bord Bia stuff and actually came back with comments that we should be using jumbo oats. I would have felt that was the right option purely on the basis that - yes it's a good product base however it is not what I necessarily about because it's not an oat product with yogurt, it's a yogurt product with oats. So they were coming at it from a different perspective. So with that in mind I was thinking about you know how are we going to thicken and hold the product so we have had a good few conversations whether it is using some oat pinhead, oat flake, whether it is jumbo oats, partial oats and I suppose out of that has come to the discussion that we have effectively settled on the more basic porridge oat and gluten free has actually featured as a potential thing that we want to get rid of here so in looking at the porridge oat, it is looking at the porridge oat that is gluten-free. So that is something that is in process at the moment.

Interviewer:
21:19: Ok and how did that feature as a potential opportunity. How did that come up?

Interviewee:
21:23: For the overnight oats?

Interviewer:
21:25: Yeah.

Interviewee:
21:26: Before I came here marketing had actually looked at the possibility of putting oats in the product. And about a month after we started talking about it you saw the [redacted] products inside in Lidl with a variety of oat flavour products so everybody is on trend. It's all… it's about the health benefits. They would also be called Birchers. Bircher was the name of the doctor in Switzerland back about 30 odd years ago around the time of the muesli epidemic across the world. He has started putting oats and this whole concept of overnight oats with milk, with fruit, whatever to just get to a point where stable breakfast going to people who were perhaps minerally deprived or you know we're just a little bit off from a health perspective and his results were apparently proved that there were significant benefits to eating products such as overnight oats. So on that concept, we had evolved and we had developed and we had samples presented to a range of consumers and then you see somebody else actually putting them on shelf. So in once sense yeah we are going down the right avenue but the products that we saw on shelf when I say in the back end of the supermarkets, they were in the back fridges rather than in the front fridges. We would have a different concept around price because the food on the go and sorry, I should have mentioned this earlier. In our discussion around food on the go, we looked at if it was a meal replacement. We put something out in the market how were they going to eat it. You eat a packet of crisps with your hands but any of the more salad types of stuff is spoon containing. So that was another improvement that we made in that the spoon is now included. So yeah there is a little bit more cost but on the balance… it was the best thing to do with it.

Interviewer:
23:37: Yeah ok. Is this the first time you have relocated products in store?

Interviewee:
23:43: I believe so. Well certainly my first time with them but I'm not aware that they have relocated elsewhere and also we will say there is an awful lot of Centra's or Tesco extras that we never get listed in because they don't do family packs and they don't do back of shop products. Typically, they are doing the high-value sandwiches, drinks, food on the go. You might be lucky to get a packet of baby's nappies or you know Panadol at the back of the shop but effectively, they are designed for fast sale in and out.

Interviewer:
24:20: So this may be a question you might not have the answer to but out of the stores that ye… the Centra, Supervalu's and Tesco's that ye currently deliver product to… how many more stores have been opened up by this new product that is front of house? As a percentage?

Interviewee:
24:40: I wouldn't be aware exactly of the number but given my knowledge of the supermarkets. You could potentially be looking at about 20% or 30% at least more stores because you have… between the categorisation of a, b, c, d stores have been the, you know, they have got everything and as you go down through the categories, certain lines are kept and certain lines are not. I would imagine that there is… it wouldn't be in the majority; it would be in the minority but certainly would be in the 20% to 30% bracket. That would be my gut feeling.

Interviewer:
25:22: Ok that is perfect. Can you talk to me about the manufacturing process of that product?

Interviewee:
25:25: Ok so the...

Interviewer:

25:27: And what have ye had to buy? What is new about it that is in that...

Interviewee:
25:32: Ok in relation to the overnight oats, oats would be the only extra inclusion. So we would take the natural yogurt. We would blend our seed as we would normally do. It is a six blend seed. It's a six seed blend sorry and also then, now we would blend the oats with that.

Interviewer:
25:52: Ok.

Interviewee:
25:53: And we deposit that on top of a layer of fruit. In one sense, it is not quite reinventing the wheel but it is… it's a variation on a current common theme where we would have yogurt on top of fruit but making it very visual through some clear packaging. On a number of the other products that we would be looking at competing with, they have opted not to have the clear packaging. So they lose… well we gain I suppose the visual enhancement on shelf.

Interviewer:
26:24: Ok so talk to me about that packaging?

Interviewee:
26:29: Well we have gone with a thin polypropylene tub and put a cardboard sleeve which wraps around the outside like a strap. It does cover all the product. It only covers the product in one plane. And so the product is fully visible other than that. And I suppose having developed and evolve that packaging, the only thing we have got to put on the outside pack is the spoon. Now we haven't gone to full product run yet so there is still time to change it so it contains a spoon because some people may not pick it up if they can't and the ironic thing is the cardboard sleeve although it is lovely and decorative. It actually covers its entirety; it covers the spoon. So you can't actually see that there is a spoon in it. That is the joys of that sort of development

Interviewer:

27:23: And has that come back as a problem that some people are...

Interviewee:
27:27: No it's a problem that we spotted ourselves when we went to do. We did a consumer brand tasting relatively recently and the grab n'go product was included in that and they were met with huge enthusiasm and for ok so sorry… going back to the rest of the process so we have our natural yogurt seeds and oats blend, we have our fruit… So we have a machine that has two separate depositors so we have the fruit on the bottom and the yogurt on the top through the rotary trip machine and it seals and it will put the lid on, put an inner seal which is the food safely seal and put a lid on which has the spoon enclosed and then it comes out through the metal detector. We then manually put the cardboard sleeve on and put them into the box.

Interviewer:
28:23: Ok and so ye already had the existing manufacturing capability?

Interviewee:
28:28: Yes, we had the capabilities to do it. You know sometimes you need to evolve certain product lines so you are getting some better utilization from those...

Interviewer:
28:38: So have ye increased the number of hours that the factory is producing product?

Interviewee:
28:44: Yes, we will be. As I said, we are only at the point of launch for this.

Interviewer:
28:50: Yes, ok.

Interviewee:

28:51: So in terms of yogurt. That in itself per se won't give us any extra hours but where it will be is at the point of packing. So the operator who runs the packing machine, he will be working extra. Exactly how much will all depend on what way orders fall.

Interviewer:
29:05: Ok talk to me a little bit about your background?

Interviewee:
29:09: My background. I worked in a whole variety of parts within the food industry. Well I suppose just before that, I mean chemistry and marine biology is my core degree and qualification. I went on from there and did a food and technology diploma in UCC and I also did a business management diploma in UCC over the last number of years. So my… I suppose my first job effectively was a quality manager role back in 1983. A long time ago now. It was at the very start of food safety. I was presented with the McDonald's quality needs on just four pages A4 and that was what we had to conform to. It was very simplistic in one sense and in essence all of the things that we currently do in food safety 30 odd years later is exactly the same. Just they define it with a little bit more detail from a customer perspective and yeah the McDonalds specification would be a little bit more onerous now but it's just a change in ascribing what they are doing. So I started in red meat for 5 years, I spent four years in [redacted] in [redacted]. I spent four years in [redacted] in fats and oils and spread technology multiplication. My time in [redacted]… sorry just to go back wasn't just straight flour milling. We also had a starch modification plant so I would have spent a lot of time working on projects such as batter, designing batter systems. For instance, now your lemon flavoured battered, crumbed chicken piece that is something like that, that would be coming out of a continental system that would be battering in line is probably seven if not nine layers of batter. So we would be designing how you would build up the layers. You have a base layer, a second layer which would give the flavouring something to bite in to so once you out the flavouring on, you would seal the flavouring, then you would cover it will another batter if by putting a bread crumb finish on the outside, then you out the breadcrumb and probably put an outer seal to keep the breadcrumb stuck to the product and probably every third cycle or every second cycle as I have described, there would be a flash baking or a flash cooking system in there. So I would have worked with customers across Europe, say the likes of Griffith laboratories. It would

be a name that the average person on the street wouldn't have notion purely because they were no more than we were, just a strong intermediary feeding the like of… whether it was any of the large batter houses. The Birdseye or these guys. But they were designing with us and in supplying the product, what we needed to do, the nature of the starch modification plant came about through working with [redacted], for making play-doh, which we successfully did and we eventually got the contract and I think one of the meetings that we were at, when we could tell them on a sample of flour where they were going to have a problem on the production line and they were bamboozled that in the end, we knew more about their product then they did. But it just meant that we studied it in great detail. We fine-tuned it, we honed it. We also designed products along the line of large scale thick batters for calamari's which developed for a company down in the southwest of [redacted]. It started with a one-kilo sample and after that t was 20 tonne a month and they were able to put one inch all around batter on their calamari's. So that was [redacted], [redacted], I worked in confectionery then for 7 years in[redacted]. I then went to; I was the plant manager for [redacted] down in [redacted] for two years. I then opted to do some contract work. So I worked with one or two organisations from a production process improvement. I then moved onto refrigeration engineering. So I spent two years in engineering refrigeration. Again, I took some time to go back and do some contract work again with other growing small businesses and I suppose the opportunity came up here and I felt it was something that… it was very close to my heart in terms of location but also of the ethos and the manner in which the business was being run. So they were probably two of the biggest drivers in me coming here.

Interviewer:
34:23: Ok.

Interviewee:
34:24: So what I… I suppose coming into a business like this I'm looking at the process in the plant. I had… I suppose in [redacted] probably would have been the single biggest number of people. I had about 124 people reporting into me down there so you know size is all relative. But in terms of organisation in structure and control, it is some of the stuff that has challenged me here internally. So when I talk about new product development, it is not purely about the next new yogurt or the next old yogurt. Whatever you want to look at it. It is also about how we are producing

and what way we process here. I actually think that new product development or product development is so much about what you are currently doing and are you doing it to the best of what you can do it, knowing that you are competing right across Europe. You are competing with guys from [redacted] and [redacted] and like when I was working in [redacted], we were benchmarking ourselves in muffin and cake manufacturer against some of the biggest confectionery manufacturers in Europe and we were winning. I got a listing in Aldi in [redacted] because I would have been commercial and production as well. We were servicing 16 of Aldi [redacted] 32 depots. So it was an enormous contract. But that came at a time when we had increased and increased and increased I suppose market penetration and by the time we were supplying [redacted] we were supplying I think it was eleven different other European countries. We had… when I started with [redacted], we started with process development and inclusion. The process didn't just end in the factory at all… so it extended out to the sales opportunities and you look at that whole value stream and how it comes from raw material right the way through so we would have started, we would have started before I arrived in [redacted] in [redacted] but by the time I was finished, I suppose seven years later we had four if not five customers in [redacted], three in [redacted], two in [redacted], [redacted], [redacted], [redacted], we were starting in [redacted] but we had grown from two to fourteen different regional wholesale distributors in the UK, all of whom were probably a pallet if not a week, every fortnight. So there was a substantial amount of business but it was all about growing, growing the lines so that you could have a manufacturing process and could, could be much more regularised and if paddy didn't take a pallet this week, [redacted] would. So you had enough eggs in the basket that you kept your process working at reasonably optimal levels. Did we get to full optimisation? No but we would have had some very good relationships with a couple of different customers in [redacted] who would have been buy in to sell on to retailer or sell on to food service and we got some fantastic information because it was no good them then keeping it for themselves so they fed it back to us but we knew that we could produce four pack muffins and cakes if not for the same price delivered to [redacted], cheaper than delivered to [redacted] then the local guys were doing given the nature of the machinery that we had invested in [redacted]. So there is a balance to be taken on… do you spend the money on upskilling and upgrading your process, where is the target market, how are you going to get it there? How is it going to suit the target market and I suppose in one sense, in [redacted], we were looking at a kind of a typical range of caramel chocolate and lemon cakes which were the mainstay product range and we had lemons

and toffees and a whole variety of coffee cakes and stuff like that but the mainstay products, the caramel chocolate and lemon, they were the ones that were the flagship products that were driving us into all the new markets. But we had a product that was very much… not what was in the market. Some of the retailers said but it just won't sell. And we said but it is selling in [redacted]. So you needed someone to get it off the mark. And at a certain point in my time there we were the third largest cake company in [redacted]. Which was unbelievable volume but great recognition on the quality of the product and we had some anecdotal evidence coming back from… there is one of the lads who was manufacturing the cake papers who, the cake papers actually came shaped back from [redacted] and he was always telling us you know… our parents had the half-moon dancake which was like cardboard… You could build walls with the stuff. That was typically when somebody went to the house, the half-moon dancake came out and you sliced your dry, inedible chocolate thing and you managed to eat it because you had a cup of coffee. But he was saying that the newer modern people in [redacted]. I'm saying modern people in [redacted] and Jesus I'm nearly going back 20 years now. That they would see themselves as being modernised by having a [redacted] cake on their coffee table rather than a half-moon dancake. So it was that whole perception and development that we hadn't even realised for our, somebody else. Because sometimes when you bring something new to the market, the market either likes it or hates it. And you sink or swim but we were fortunate enough that we were at such a midpoint position in the half-moon dancake that was solid at one end and the cream cake at the other end that is going off by the second and we were somewhere in the middle and it just gave us a huge point of difference.

Interviewer:
40:55: Ok so talk to me about the process that ye have here. What are you trying to bring? What are you trying to change? You know… you mentioned that looking at the process is a part of your role. What are you doing?

Interviewee:
41:09: Right. There are a number of things that I'm trying to bring to this. In relations to the straightforward process we are currently inoculating or were inoculating for 16 hours when I came. I have now brought that back to 12 hours. Inoculating being adding the bacteria and allowing it to develop and evolve in the yogurt. To actually manufacture the yogurt. So it is a gestation, it is a

maturation period. It’s a bit like cheese making. Yogurt making would be similar. It's a fermented product and we are looking for the pH difference that the bacteria give the texture, flavour characteristic of the product. When I look at… having met a number of the key suppliers, the bacterial inoculation should not take any longer than somewhere between 6 to 8 hours and we were inoculation for 16 hours so I was going… you know there is going to be a problem here lads if I need fresh yogurt… two bins of yogurt every morning. How are we going to do that if the stuff from yesterday has to sit there for 16 hours...? I can’t process it tomorrow. So the evolution of the effectiveness of the bacteria needs to be down, certainly within 12 and they are talking about 6 or 8 hours purely because the batch from the previous day has to be out… washed out so you are trying to look at 12 hours’ production, 12 hours’ inoculation. From start to finish from a dirty bin washed clean, fresh milk, pasteurized going in, inoculated, get your timeframe and get enough time to cool it from because when you inoculate it goes down to 43 degrees so it is a little hotter than body temperature and that is when the bacteria are most active and the most activity occurs in the bacteria in the first two to three hours and then after that the pH is dropping so the activity is actually diminishing up to the point of when you turn on the cooling so going from 16 to 6 seems a lot… it’s partly to do with the physical infrastructure of the machinery that we have and the gestation tanks are, well we use them as 8000 litre capacity. In theory, they should probably be the 5,500 to 6,000 litre capacity purely because the yogurt at the very top of the tank doesn't get the same amount of cooling heating that the rest of the tank gets because it is just too far up the tank but, so that is where in part the compensation is for the extended gestation period. You could understand it going from 6 to 8 hours but I can’t make sense of it in my own head going to 6 to 16 hours. It just seemed to get better and better the longer you left it and seeing as time wasn't a feature that was a constraint, the time expanded to fill the space. Yes, the longer you leave it, yes perhaps you will have a better yogurt but it’s not always… it doesn't always follow because you have to look at your standardisation, you have to look at your protein qualities, you have to look at your… the other textural aspects that can be given with other inoculants so that it is not just using a, you have… sorry, you have to use two bacterial cultures to be technically termed yogurt, but it doesn't limit you to only two. So you can use three or four or five and each of those extras can give other flavours, textural attributes that the primary two may not give you. So in terms of the process, we have now moved from 12 back to… sorry 16 back to 12, back to 10 in a controlled way over a two-month period whilst being mindful of the quality attributes in terms of the milk

standardisation. So by starting with the same product every day, hopefully, we are in a position to make the equivalent comment about sequential batching whether we are improving, disimproving, thicker, thinner. You know… why is it different, why is the flavour different today and to go through that whole decision-making process in terms of process improvement. The end goal for me in terms of that particular process improvement has to get down to about the 8-hour period so that with a couple of hours of cooling after it you are then straight into being able to process twice the amount of milk then we currently could process. So I am looking down the barrel on an annual basis we could process about [redacted], or we did process about [redacted] litres of milk. This year we probably will be knocking on the [redacted] litres but if… sorry I will just do one quick calculation as I'm talking to you

Interviewer:
46:25: Take your time.

Interviewee:
46:27: So… 16,000 litres a day, 5 days a week, say for 50 weeks of the year with holidays and everything else you could argue that the potential on a Monday to basis is [redacted] litres. So we are at about 50% capacity. Which means there is a huge opportunity for the same footprint, for the same cost base, for the same insurance, for the same rates. There are so many other costs associated with the business can now be halved in real terms by going from [redacted] to [redacted] litres. Now the target in my own head is to get us in the [redacted] litres bracket. The [redacted] litres probably won't be possible on a practical basis without doing some weekend work. So purely on the basis if you're running 24 hours a day. 12 hours' production, 12 hours' inoculation, washing, you will have a hangover effect that will probably push you forward you know a half an hour maybe a day or an hour a day and by the time you get to Friday, you are halfway through Saturday. So I'm trying to be realistic in terms of the [redacted] litres. So that is… when I start looking at the process I say well what is my maximum capacity?

Interviewer:
47:50: Yeah.

Interviewee:
47:51: Ok and I work backwards from there. In similar, if I just go back to [redacted]. We targeted the product in [redacted]. We got the interest from some of their retailers over there. I designed a product backwards from the shelf in [redacted] back. Now you might say, all the shelves are the same. They are not exactly all the same. Some are deeper shallower, taller, wider shelving units. So we picked the design of the… we designed the box to fit the shelf, we designed the cake to fit the plastic box, to fit the cardboard box. So we change the size of the cake, we changed the size of the paper, we changed the size of the plastic acetate, we changed the size of the box. And we designed the box on the optimum space utilisation on the pallet which meant that when I had all of that done. And this is the way that I think. I was actually shipping the product to [redacted] for free. Because we got extra cakes onto the pallet. So that went from 700 to 800 cakes and that 100 cakes carried the cost of the product. So...

Interviewer:
49:00: And...

Interviewee:
49:01: So when we start talking about optimisation, I look at the whole process and I look at it backwards as much as I look at it forwards, purely because it is critical. There is no point you developing the next best product. But nobody wants it because it can't fit on the shelf, nobody wants it because it's the wrong colour, nobody wants it because of any other number of reasons. So you have to know what your market wants. Or you have to know at least be... if you're going to be different, you need to know how you are different, why you are different and you need to upsell those differences as being the next best thing for the customer… for the buyer. You know these guys and they are sitting in the office

Interviewer:
49:40: Your retail customer?

Interviewee:
49:43: Your retail customer or food service customer…

Interviewer:
49:46: Oh yeah, yeah, yeah.

Interviewee:
49:48: It doesn’t matter who. It’s your customer full stop. And if your customer doesn't get excited about what you're telling them about you know, your process development is dead in the water because there is no point coming out with a green one because we had a red one last week. You know, maybe they are colour blind, I don’t know… and to them, they all look the same. So you have to be mindful at what it is that you are trying to develop. Anyway going back to the process

Interviewer:
50:17: Yeah.

Interviewee:
50:18: So that is one of the things that I have already done here now. There is still more work to do on the consistency of the inoculants when we are down at the 10 /8-hour bracket of inoculation, I am now getting some flavour distortion. So I have now engaged with them… back to the guys who are supplying us the bacteria and they are meant to be standardising the bacteria delivered to us. They are telling us… like they recommend 6 to 8 hours’ inoculation is fine but if I’m down at the 10 mark and I’m potentially losing flavour well then there is something wrong with the base or how the base is reacting with the milk or are we overloading it with too many bacteria or too many target organisms that we are trying to put into it so there is a whole load of different questions and queries. I suppose going on from that, where I need to get a handle on that. So in terms of the process, it is not just straightforward, you will then start entering in to, technical difficulties, and as I described the tank, maybe this is part of the sensitivity, that suddenly we are in a very sensitive area that instead of having 8000 litres, maybe I can only have 6000 litres in the tank

Interviewer:
51:48: Ok.

Interviewee:
51:49: To do it properly, rather than doing 8000 litres. The tank can physically take 8000 but it is not piped and managed for 8000. It is only piped and managed for the 5 to 6000 bracket. So maybe we need to revise the volume of yogurt that we are making in any individual day. But then that brings us straight back to… if I need 24,000 litres of yogurt or sorry, 18,000 litres of yogurt say doing two 8's and having a small bit of yogurt left over from the previous day rather than doing 2 6's and then doing a third 6 for the day after but having enough time to regulate that process. So it… I find it fascinating to see how we can affect an appropriate change around the process while still making a safe, wholesome, original product and like we don't add any sugar into our yogurt. A lot of people add sugar to their yogurt because it helps the bacteria activate. We don't because we stay true to the pure unadulterated, natural products. So typically our products would taste a little bit sharper than a lot of other people's products because again, you lose the sugaring effect and… but I think it is something that gives us a very unique attribute and I think we shouldn't change that. And then that then feeds back into everything else. So that is in terms of yogurt manufacturing. In terms of fruit manufacturer. When I arrived here we had just enough fruit manufacturer in house. Our own fruit cooking. So I was involved in the evolution… although some of the framework was built in the… you know we were utilising an existing cooking kettle that we have on site. It was developing the process around the CIP sanitising, and then physical handling of the cooked product in the tanks and subsequently the handling of how we handled the tanks themselves post cook. So we kept… I suppose as the nature of the process went on we were looking at why we were having particular problems with certain fruits. We have a problem with this fruit but didn't have a problem with another fruit and why was it different and so we have now established a much more elaborate standard… standard procedure in and around the handling of the fruit tanks once the fruit tank is filled it's never actually opened untilled it is empty.

Interviewer:
54:44: Ok.

Interviewee:
54:45: Whereas previously we were taking some… in order to open the… we had older tanks which necessitated that you actually had to open the hatch. Now with the new tanks that we

purchased, you don’t have to do that so we have to change the engineering around the tanks. So all of that was done in order to get us to a point where potentially you could actually utilize compressed air to actually push the fruit out, or nitrogen to push the fruit out. But it is still an evolving process in trying to make sure that each of the individuals handling the tanks… that they know exactly what they are doing and how they are doing it so that they don’t inadvertently cause a problem because I don't think anybody would set out to cause issues but it was maybe an element of ignorance and that is in the purest sense of the word as distinct from being deliberately negligent.

Interviewer:
55:48: Yeah.

Interviewee:
55: 49: So I suppose we have that… that sort of systematic mentality as well that we need to change from what we did because go back 6 or 8 months ago… all the fruit was all brought in and we did whatever we did with that fruit. But now that we have brought that in house. There were huge reasons to do it. There were huge cost reasons to do it but equally you could say there is a cost reason to do it but if you physically can’t get the same quality of product, you have to then question you know… we have made this big investment, we need to be, it has to work and if we can't make it work, well then we need to go back to the old finance situation. Nobody kind of wanted to go back because it stopped us evolving. It stopped us doing other things that we wanted to do. Being able to test, check and cook any other variety of fruit. Otherwise it would take months to get samples of different things in so you are much more fluid in responding to market price changes on fruit and everything else so… or even if you have different blends, to be able to regulate those blends on the basis of you know the way the current pricing is in order to keep your target price at a certain point so that you can propose a price to your customer so the end customer will pay the right… will be prepared to pay x amount for it whether its 2 quid or 1.50 or whatever. So again… being mindful of that whole value stream from the point of entry right to the point of exit.

Interviewer:
57:29: Ok.

Interviewee:
57:30: So that is standard yogurt and fruit. I suppose I have spent an awful lot of time on those in the last couple of months and the yogurt as well with the milk standardisation there is… all of those projects are very interwoven and trying to be focusing on one particular attribute can be difficult at the time because it is affected by so many things.

Interviewer:
57:50: Ok. Perfect. Can you maybe outline for me another beneficial change that you have introduced in the past few months and I know your time… or maybe just highlight the most beneficial change even if you have already spoken about it?

Interviewee:
58:06: Yeah I suppose the most beneficial change and I suppose I always equate back to finance would be the milk standardisation. So there is… there is a significant improvement there in value benefit for the organisation in that. Probably to the tune of somewhere between 50,000 or 60,000. So that is probably the single biggest change. It has also meant that a lot of the headaches… the historic hangover headaches that we would have had from... Oh what is the yogurt like this morning, it's thin, what is it like this morning, its thick. That is my, having spoken at length to all of the various vested interests in the business, both [redacted], quality manager, production manager and [redacted] as well, that we are now at a point where not that we have gone complacent but where the consistency is… well more consistent. The extras are thicker but consistently thicker. The flavour is consistent. You know… the pH's are more consistent. And so what we are not doing is... I suppose out of that has come another refocus on the exact temperature of the yogurt coming out of the process, the exact pH and looking at using the temperature pH profiling more of an indicator as to the yogurt quality now than would have previously been done. Yes, they would have looked at pHs, yes they would have looked at temperatures but it kind of didn't really matter because the yogurt was either thick or thin but now we are at a point where… if we do A and we do B and we do C then, then we will be right. So there is a lot more confidence around the product and equally, it is now allowing us to focus on elements like the consistency of the heating system. The consistency of the cooling system. You could never look at that before because it was hit and miss and you know probably at times, more miss than hit. So within that whole milk

standardisation, yogurt generation, it is you know, 60% to 70% of everything that we make so it had to be one that we were really focused on. So that was probably the biggest one. The second biggest then would be the process of the cooked fruit and from that perspective, it is bringing that in-house gave a substantial economic benefit to the company. Also gave a substantial amount of extra hours to certain personnel on site because now we have to cook everything. So you know… there was a double benefit there. More work in house, most cost-efficient, but more control over what is happening.

Interviewer:
61:14: Very good. Looking at your innovation process. How are ye actually searching for new innovative ideas?

Interviewee:
61:22: With the sales department I have started a process that we are trying to target a two-year evolution system going from blue sky ideas to what can we do with yogurt, then go back even further… what can we do with milk. Because we make cream cheese on site for our cheesecakes. You know… we could make fromage frais, we could make quark, we could make any other number of slightly… you know cheese is a potential product. You know if we are doing fromage frais, yes we could make a soft cheese, could we make a mozzarella type… so there is potential. So what we are trying to do is sit back and look at the market. Look at what has worked, look at what potentially could work with a [redacted] style on it. Because there is no point going after a yogurt product that needs to last 110 days. Because we just will not put the preservative in there in the first place. So you know… there are certain parts of the development process and we will say we just won't be doing that. Using invert sugars, using all sorts of other E numbers and descriptions. We won't be doing that unless there is absolutely no other technological way of achieving that product.

Interviewer:
62:55: Ok.

Interviewee:

62:56: So [redacted] and [redacted] would be very clear on that. In my brief, in one sense, when I look at previous businesses that I was in… I would have got the latitude to use anything to achieve the product. Whereas here now we are a little mindful as to the trust that consumers are putting in us and the nature of the organic wholesome nature of the product we are making and staying true to that. And perhaps we need to be true to that to a point. The point is that we can still trade. We do not make any product for any retailer in its own brand. Everything we make is under the [redacted] label. We probably are unique, certainly, for the number of other yogurt manufacturers in the country that I'm aware of… we would be unique. [redacted] makes, [redacted] make, [redacted] make, they all make supermarket branded products. We haven't had to perhaps and in certain conversations, maybe we will never have to… but maybe we will.

Interviewer:
64:14: Ok.

Interviewee:
At a certain point in time. So we are not foolish. There is no point in being the fellas standing at the top of the hill saying… we are not going back and next thing… if there aren't enough people buying your product that is it. You fold. So from my perspective… the, I suppose, that whole development process is giving us something that will probably make us a little bit more niche. We have already established that we need to evolve a development plan against probably a 6-month lead-in. From concept to delivery of product to the customer. With various gatepost along the way with shelf life, practical samples on prototype samples that we present. You know, is this… would you run with this. A lot of the retailers, in a lot of ways, they play it very safe. But they would be open to something a little bit different, particularly if they were first to market. So you would be trying to evolve a certain number of points of differentiation and perhaps allowing that new product development premiumisation or uniqueness to bring to a single retailer that might be allowing you to be able to not have to deal with some of the other commercials that they want to deal with. Look we will give you an individual supply of these three products for the next six months but you are going to have to live with your margin at the moment. So there are always negotiations going on and that might allow you a renegotiate for a period of time. The exclusivity part of supply can be used as a tool for sales and marketing, in the sales and marketing toolbox to be able to achieve

other objectives. Do we want to sell more within all of that? Yes, we do but we have to have a defined process that is going to get us from A to B. We have to have a defined process that is going to utilise all of the equipment we have outside to its best. We can't get lost from the fact that, yes you can keep buying pieces of kit but you need something to pay for it. Grant aiding and funding… that is something over the next period of time that is going to allow me to focus a little bit more on some of the groundbreaking NPD and R&D products and projects which will allow me to play with some of the pieces of kit that we have in a more profound way, pushing the boundaries, pushing the limits so that we will have a potential reservoir of products that we can go back and dip in to that we can present to clients.

Interviewer:
67:28: Ok and how much are ye investing in that R&D or what will that R&D even look like?

Interviewee:
67:35: In terms of… initially it looks like me.

Interviewer:
67:40: Ok.

Interviewee:
67:41: Outside of that then in terms of the R&D funding support. That will be through the likes of Enterprise Ireland. Typically get a rebate of about 40% on the basis of time, raw material and you know other energy supplies contribution. So that if we evolve, say for instance now. We have a new butter churn and that was… when I think of all the process developments and change that we have done; we have a new butter churn. And that would allow us to do other things a little bit differently. We have a dry mix additive to be able to add herbs and spices as well to the butter. So as well as just salt, so you have salted, unsalted, you have maybe you know flavoured butters then that potentially you could target, say all the local butchers with… you know if you had a whole grain mustard butter then you could have discs that you can maybe slice and freeze that you could maybe put in with various pork products, mint flavours with lamb, you know that evolution. So there is the possibility of doing a lot of that as well as even blending the butter with something

else. Making it more spreadable. We also have the capacity to beat the butter much harder as it is coming through or under prepare the cream so that we actually make the butter softer and harder. We discovered that out of a mistake. Sometimes not every mistake is a mistake. It's always planned. Let's do this with the temperature. So we know that we can manipulate the attributes of the finished product with some of the process techniques. So we are… because of the problem that we made for ourselves in one of the trial days we made… we had two and a half tons of cream that we couldn't use because you could hardly process it because it was so soft. We are now looking at a tub of butter or a cup for want of a better word of butter. So potentially looking at [redacted] developing a butter cup. So you know the turns and twists and I know we had a discussion with the sales and marketing people and they were losing themselves in the possibility of Oh my god you know, a buttercup. It's the same as what Dairygold have in their pack. And they went, what? And I said yeah look, so I brought it up on the thing and you can see there is a little cup in the middle of the Dairygold pack. I think there were 9 people at the meeting and 4 people had never seen the buttercup. So it is all this subliminal messaging that the likes of Dairygold are using and you know… there is a lot of techniques and mimicking around that you can do with it but it's, it would also another product that we can make in an existing piece of kit that would be dramatically different than anything else we have ever made. So when you talk about the process, that is also part of…

Interviewer:
71:08: The product innovation.

Interviewee:
71:11: Yes.

Interviewer:
71:12: Ok and so how do ye actually select what ideas to bring forward or to progress?

Interviewee:
71:17: That is a very difficult question. A lot of it is to do with looking at active market research.

Interviewer:
71:25: Ok.

Interviewee:
71:26: Engaging with the end customer and we are after coming through a process. It is something we do or something we have done I think about every two years over the last 6 or 8 years and it is amazing how… looking back how certain aspects of the market has changed. We engaged there recently… we had over 500 people involved in a variety of tasting between Cork and Dublin, 250 in each location and within each location each of the groups were in half either [redacted] buyers or not [redacted] buyers. That is how they were categorised. Looking at the demographic, looking at the information, looking at what they would like. So looking at the more generalised and looking from the outside in, looking at what they can do and we are actually bringing the brand focus team to actually meet some of the retailers now over the next couple of weeks to be able to tell them… well this is what our research has found. Because sometimes the retailers need to be told what the market research is. Because there is no point you keeping it all to yourself and then telling them well these are the next three products you need because I'm sure the likes of [redacted] and others, they will be presenting the information in the manner in which they think it should be presented for their own best interest and you know… fair play to them. So we need to fight some of the big guys and be able to do all the T.V advertising and the pull through and the price downs that they are doing with all the retailers. But we have other things to offer and I think if the retailers see that there is other value to be offered here… other consistency you know that there is… and particularly around new product innovation that there are lots of things that they will react to and they will be able to justifiably bring a product in and you know range it in a much broader number of stores rather than ranging it in 10 stores, they would range it in maybe 100 stores.

Interviewer:
73:33: Ok.

Interviewee:
73:43: So that from our perspective you have a much better pull through and economy of scale in manufacture because not everybody is going to be looking for the same thing every day. You know

given that we are supplying the Musgraves, the Tesco's and that is on a 5-day if not a 7-day basis that we need to have a certain critical mass to be able to go into production so we need to be able to see that. Over the next 5 to 6 days we are going to use 30, 40, 50, 100 cases of product X and to be able to keep manufacturing and filling the back chain behind it. So you asked how do we get the ideas. I suppose historically it would have been more subjective but hopefully we are trying to bring a degree of real objectivity in to it and targeting products that we feel match the demographic or the particular attribute that people are looking for out of a product and by doing that, hopefully, retailers will react positively and say yeah look that is exactly what the market research is telling us so yeah let's go with that.

Interviewer:
74:49: Ok. Very good.

Interviewee:
74:51: And so that is it.

Interviewer:
74:54: And so how are ye actually implementing those innovations?

Interviewee:
74:58: Well in part… some of those ideas that the market research had come up with was the likes of the grab n'go. So we were ahead of the curve on that so there is still a lot of other variability you know… Greek yogurt has almost become a subcategory of yogurt. We don't do any Greek yogurt. So Greek yogurt is very much on my agenda. Kids yogurt is very much on my agenda as well. We have already developed a product that is launching in Pallas foods this week and it is, although it is still a… from our perspective, it's still a full sugar product as 4% from pretty much any other retailer it's a reduced sugar product… added sugar product should say. And I have developed products that are no added sugar and they are quite sweet using a whole variety of fruit concentrates and this, that and the other but still have a very natural production process. There would be no problem making a no added sugar yogurt in the morning if I had full access to a whole variety of different chemicals and invert this and double sweet that but again it wouldn't be true to

our brand. So our… I suppose our ethos is that we will continue to evolve the no added sugar product and I have a brief over the next month to 6 weeks that we would have evolved to the next level. So we have launched now this product with Pallas foods and so we are between 4 and 5,000 units a week and we are targeting a lunch product so it is going to be lactase… sorry a lactose-free product. I was pushing that part of the agenda. I know [redacted] wasn't too convinced but more recently he is after seeing some research and looking at the intolerance factor in dairy to the point that perhaps we should be considering lactose free for everything. So it did cause an element of confusion in the new lines going into Pallas because they were saying, well right, what is the average and I was saying the allergen is no longer there because we are eradicating it. We are still declaring it as from cow's milk but its lactose-free. But their confusion was around… well are you using lactose-free milk? Or are you adding the lactase and hyrolising the milk in the middle of the process? Well, I said its two sides of the same coin. It doesn't matter whether we were buying it in or not. I said we are in fact adding lactase to the process and we are adding it at the inoculation stage and it's far more effective and it needs less gestation time and also it is active in the product right the way through so its active up to the point of consumption. So if there is any trace of lactose in the yogurt after 24 or 48 hours, the lactase is still active and will still keep activating and so what I would love to have had is a lactose free, no added sugar because that product does not exist in the market and being a point of difference, if I could do the sugar, I knew I could fall back on the lactase or the lactose free. And I suppose you know… I have personal reasons for that given that my young fella when he was a kid he didn't… he couldn't tolerate any of the cow's milk so he was on all sorts of soya's this, that and the other. Nothing kind of agreed with him and eventually he was big enough and he was onto solid food so it didn't really matter but at the same token there is an awful lot of people in that bracket. So the way we are designing this product is to appeal to post weaning… so 18 months plus. So it is not a 7 year to 17-year-old. It is actually an 18 month plus bracket and we believe that given the wholesome nature of our brand matched with a no added sugar lactose-free product that would really work in that space. And I think the market research bore out… didn't bear out the lactose free element of it but that is big… to be lactose free of something is a big thing in terms of categorisation and sometimes if you are free from something… just because the thing beside it isn't free from it doesn't really matter but you can claim a position because you can claim the free from branding and I think from a kid's perspective lactose is a digestive issue and you know so… let's take the lactose out of it.

Interviewer:
79:57: Ok and so out of each innovation that you are pushing forward, what benefits or what value do you typically look to capture from these innovations?

Interviewee:
80:05: When you say value, you mean monetary or do you mean...

Interviewer:
80:09: Yeah in monetary terms?

Interviewee:
80:13: Well I suppose a result for me would be growth, sales growth in a category that might not be as flamboyant. It may be sluggish; it may not be matching growth from other competitors but then we need to start looking at our subcategories. How much value would I see in us going to Greek yogurt? Huge. But I have to sort out what we are doing with tanks before I can figure that out because at the moment I don't have space to make Greek yogurt so going for… so I suppose when I am looking at developing things, it's just developing other things but I need the space to be able to develop them.

Interviewer:
81:08: Yeah.

Interviewee:
81:09: So it is either make smaller amounts of yogurt more frequently so that I can then drop parachute one or two bins of whatever we are doing… Greek yogurt in this, standard yogurt in that and we move on. The whole value side of health, wellness, low fat, no added sugar… Like these are all the things that we are driving on. Trying to put an economic value on those. I mean in essence, if I'm going from [redacted] to [redacted] litres of milk then you would be looking at doubling our output at the end. So going from the likes of [redacted] to [redacted] plus in turnover. That in one sense would be success.

Interviewer:

82:06: What markets or where are you planning on pushing this extra output?

Interviewee:

82:11: Domestically. But also internationally. I had said to [redacted] and [redacted] before I started that we should be targeting a stand in Sial (international food exhibition) in Paris this October because Brexit is coming around the corner. We have an awful lot of business in the UK. Over 30% of our business is done in the UK and that is… that is an issue potentially, we will discover on the first of March or the first of April next year that there is… what is the tariff going to be on X goods and Y goods and that potentially is going to be a big problem. Some of the products that we ship to the UK would be tight enough on margin and we need… some of the innovation in the control and the process is all helping add to the margin base. It might not revolutionise it but it might make it, that it is actually palatable now rather than delisting something because sometimes you need economy of scale even if some things aren't very economic but you need the breadth of product range to offer because otherwise, they will say, look there is no point in us taking two products from you, forget it, go on. We will get six products from Missus Beatty's yogurt factory down the road and I could see there could be a significant change in the manner in which, particularly small producers in Ireland are going to be hit by Brexit. You know… we were at a, myself and Graham, the accountant, we were at an EI conference last Thursday… Thursday morning and it was… yeah it was… it was difficult to hear some of the things they were potentially talking about. It was heartening at the same time because we are all in the same boat. So we need success stories and... sorry the… jumping back into process. Some of the things that I would have identified in having looked at a product and process here is that our cheesecake… it's lovely on day 1, day 2, day 3, day 4 but by the time we get to about day 10 we are well and truly gone over the hump and one of the process developments I'm looking at is removing all the animal content from cheesecake which includes the animal relate as well as the gelatin that we use to stiffen and thicken so I'm trying a whole series of different starches. Now none of that would have been done before in trying to looking at coming up with a certain range of product that will give us an attribute that will allow us then to become vegetarian. Because at the moment we are making these… what look like lovely wholesome vegetarian products but they are not vegetarian because there is animal content.

Interviewer:
85:05: Ok.

Interviewee:
85:06: And in the middle of then you have the gluten. We were talking about gluten-free there earlier and I'm looking at going gluten free on the cheesecake base. So we are using a biscuit crumb at the moment so in my afternoon after my EI enterprise experience up in Cork last week. I ended up in… well I arranged, I didn't just end up there. It was an arranged call in

Interviewer:
85:34: You didn't get lost.

Interviewee:
85:37: To a gluten-free bakery above because we use about a ton of biscuit crumb a week so it would be a nice little contract for somebody and so we were looking at the possibility of what we could and couldn't do and their process development and how… what I could live with and what I wanted and so there is… there is a nice bit of progression and development there. So we'll just have to wait and see how that evolves but again in terms of process development, taking the animal part out of it even if I don't get the gluten out of it, that will be a big step forward. And equally if we are mindful of what customers are saying, some of the items that we have in the cheesecake, for instance, there is palm oil used in the manufacture of biscuit but on the ingredient base you don't, we didn't add the palm oil and you have certain customers engaging with you talking about the orangutans and the deforestation problems in Malaysia and then you are trying to say to them that we use a responsibly sourced palm oil you know. That doesn't seem to crack the nut anymore so we need to be a little bit more innovative perhaps and that is not just one or two… we have had several complaints.

Interviewer:
86:54: Ok

Interviewee:
86:55: To the point that some people have complained and yet they didn't even buy the product because they wouldn't buy it because… so you have to take into consideration some of the negative impacts that components and ingredients in process can bring… so if you have one complaint, typically you have 10. 9 that you never hear about. You have… if I have notice that there is a number of people commenting and talking about palm oil, we have to do something about it. Because you are possibly at this stage looking at hundreds of people. So that would be an innovative relaunch but we would need to get it… if not of a similar taste profile we would need to get it to an acceptable taste profile and that is the way I would term it. It's not going to be the same because we are going to change the product a little

Interviewer:
87:50: Yeah.

Interviewee:
87:51: And it's how much the little will they live with. Will they like it; will they say oh my god this is so much better. And whilst at the same time taking the animal content out of the cheese and talking the animal content out of the thickener. So we are challenged with a number of attributes there but I'm making slow and steady, I believe progress towards that. So we started talking about process, we started talking about putting things into a timeline… it's probably going to take me the guts of 12 months to sort that out because its more than one thing… it's several things.

Interviewer:
88:43: Ok perfect. Do you know, as a percentage of turnover, how much do you spend on R&D? You have mentioned it a few times.

Interviewee:
88:47: How much we have spent…

Interviewer:
88:50: Or even a percentage of your turnover of how much you spend per annum?

Interviewee:
88:56: It's probably in and around 1%.

Interviewer:
89:00 Ok and is that going to increase or decrease?

Interviewee:
89:04: That will increase in one sense. Having the accountant with me at the Enterprise Ireland conference there last week… it is heartening from in perspective in looking for funding or looking to develop and grow that the more you spend on R&D equals a more successful company, or business with faster-increasing turnover, faster-increasing market share and there are so many positive correlations to spending more on R&D and I think that you know… when things become tight, R&D goes out the window in the old thinking. If that was the thinking you know… would Apple have ever developed the iPhone. If that was the thinking would I don't know… Henry Denny ever have made the sausage. I don't know… you know what I mean? Like there is… you can be blind and you can be short-sighted because no more than you know… when we stopped building houses 10 years ago in this country… now we want to build them and the skills are not there. So if you decide to change a point of focus you need to be damn sure that you don't need that point of focus going forward. Because if you say, ok we don't need any NPD at the moment and we will reallocate my NPD manager into sales and marketing for 12 months because we don't want anything new. I need to sell more of what I'm already making. That might be a better utilisation of resources with the prospect of getting that person then back in-house in 12 months' time when we have ridden the storm out assuming that the NPD person has stayed. That they haven't moved on. So if you lose that sort of skill set and mindset within a business, I think it is very, very difficult to get it back… and that you know is a huge concern. In terms of it being 1% here yeah, is that enough? No but [redacted] and [redacted] now know that and I suppose that is wherein creating the role for me here, that is where they were coming from, that is what they want to see. Hopefully they are seeing that I'm delivering on some of the things that we are talking about and there are some other, more innovative, I suppose process and product developments and improvements that I can't talk about even at the moment because… we are only in the very early infancy stages. But I could

see them being game changers in terms of where we will be in terms of where we will be with Greek yogurt and other just standardisation of general product and process and you know… its, there is an awful lot out there that we can improve with. There is awful lot out there that we can grow with and it's trying to back, make a reasonable decision to back the right horse or horses and hopefully in a nine-horse race we will have nine horses racing and so everything will be winning and so that... it starts and ends with the customer and I don't mean the retailer. I don't mean next down. I mean you need to look at the very far end of the value stream and be able to work backwards from that. I would be a great advocate of that. You have to be able to work forward and back. But you have to be really on what do they want, how is it going to get through, you know, we don't have the shelf space to put product on so how do we convince these guys in the middle to put the stuff on the shelf so that we can deliver on what the end consumer wants. But I think by engaging the retailers with the brand development people and the consumer, watched on people that we would stand a very strong chance of getting where we feel we should be going.

Interviewer:
93:25: Ok that is fine. Last two questions. Can you outline what kind of capabilities or skills do ye need to further develop here at [redacted] for the future?

Interviewee:
93:33: We have a very young production manager, relatively inexperienced. She is learning, I suppose… we need to upskill that. I'm trying to spend what time I can with her in terms of developing and growing. I would see supplementing her knowledge and even giving her further supports. We only recently put in supervisory support for her that I would see that growing substantially. The… I think the next challenge for us is going to be continental Europe sales management. No I know… [redacted] and myself, we did the interview a couple of months back. Part of the interview we completed through French. I would be reasonably competent having spent a year and a half selling fish directly to the French market. Being on point with my numbers and letters and whatnot at 3 o'clock in the morning selling fish to a French man, you need to be on the ball.

Interviewer:

94:51: That is for sure.

Interviewee:
94:54: But it… So I would be able to certainly support that in the short term but I would perceive that would be the next biggest challenge for us is to have and I would say in the short term, to have the right partner. I don't envisage that we should necessarily put boots on the ground in [redacted] immediately. I think that if we are going to enter and we need to enter the European market because we need to offset potentially 30% of our business next year. Because if we don't get it right early… yes can we just make product with French labels on them? Yes, we can. We can do it in the morning… you will double production. And I suppose in one sense, you know and I have kind of reiterated that here. When we wanted to grow business in [redacted], you know you get to a certain point of saturation in the marketplace that you are in and once you have got to that you kind of reach that zenith and then it's about managing it and then you move on to a new jurisdiction. So in [redacted], we had [redacted] sorted, so we moved onto Holland, and Holland sorted so then you move on to [redacted], [redacted] sorted and you move on and so on. So by organic growth, and in no jurisdiction were we huge. In yogurt terms… we were never a Muller brand or anything like that. We were very much a [redacted] type brand in terms of size and volume. But you just keep going through the next series of countries. You will find something that will work better in one country than another. Flavour profiling you know… each of the depots in Aldi [redacted], when we actually plotted all the depots on the map, all of the sweeter, the sweeter balances in we gave them the option to be able to pick 20 cakes out of a box. There are 3 flavours, you tell us how much you want out of each and we will do that for you. We ended up with all the guys nearest [redacted] had more lemon in them and all the guys nearer to [redacted] had more carrot in them. It was actually because it was like a real east/west divide

Interviewer:
97:08: Yes.

Interviewee:
97:09: But what that does mean… even within the product range that you have, there is going to be a sub-categorisation depending on the jurisdiction that you are looking at and you need to be

aware of potentially what that would be and you need to be in counter, maybe a lot more market research then that you would be looking at, into some of these places that you are looking at Bord Bia supports to be able to do the proper market research on the ground just before you are launching or just before you are knocking on the door of Albert Heijn in Holland or whoever. There are some fabulous partner type arrangements that we are such a wholesome, in a lot of ways unique product within the yogurt space that we should be demanding space for the original of the species and not this sugary, floury rubbish that you are selling that all looks the same. 10 different flavours but all looks the same because it is and they have just added a little bit of extra flavour in one or the other. Ours looks absolutely and totally different… from the packaging in our lovely little glass jar right up to the point of you know… the style and type of product that we are putting into the jar. You know so with that in mind I think what is next for [redacted] is driving product out the door. We are not taking a stand in Siel but we should be at either the Portuguese / Spanish Alimentaria trade show next year. I'm not sure is it Barcelona or Lisbon next year but we need to start pushing the boundary.

Interviewer:
98:54: Ok.

Interviewee:
98:55: We need to start going to the likes of the Anuga and all of that out there so that we can… we can show our products. Because people will see it and buyers will come up and say, I never saw this before. This is fantastic, this tastes wonderful, where can I get it? I mean I will never forget one of the trade show that we went over to in [redacted]. It was this particular guy from [redacted] and he had just… we were right beside a guy who had copied our products and he had just tasted his products and he said "no, no, no, I have seen the products" and I said "you haven't seen the products. These are the original, he is the copycat." And so we have a bit of banter as he was walking down the row and I was watching him and he turned around and came back and was like alright so I will taste it. You have convinced me it's the original… it better be nice. He tasted it, and he tasted the next one, and he tasted the next one and said these are amazing and I said yeah, I told you we are the original. At which point he pulled his cheque book out of his pocket and said "I want to be your regional distributor in [redacted]. How much is it going to cost me?" at which

point I introduced him to the owner who nearly collapsed because like if he was going to write a check he would want to be writing a check for 20 or 30 grand so anyway so ended up deciding that we will give him his first delivery and we saw how that went so we never actually engaged him as an agent, which is actually something that a lot of Irish companies don't understand. If you engage someone as an agent and you stop trading with them because you are trading with the fella next door to him, you still have to pay the original agent. There is like… it's like an employment contract with an agent.

Interviewer:
100:44: Right ok.

Interviewee:
100:45: So that is a… again and from my perspective, parts of that knowledge is very important when you start looking in to a new market to know the pitfalls that if you pick the wrong agent, in inverted commas that you can get out of it without it costing you money because some of these guys have arrangements that potentially you could be signing up to a contract and you think it's on a load by load basis and your man is saying… I'm made for the next 20 years. And that is it. And even if you don't sell, he is still looking for payment because well it was on the basis of this amount of business that you hired me and now I'm available to do that. A number of Irish businesses have been stung. You never hear of it because nobody wants to tell you. It's like the fella who loses his money on the horses. You will never find out what he lost but you'll always find what he won on. And… but equally, it is as important to make sure that you know that you have sight of the products and ranges that you have. Bord Bia are pretty good in relation to passing on good quality information and I suppose I would have dealt with most of the heads in the different Bord Bia, whether it is in Madrid or Lisbon or Paris, Frankfurt, Amsterdam. I would have worked with most of those guys over the last 15 or 20 years so if I don't know something about a product or consumer, I know, at least I know the office to ring. Chances are I'll probably know the person in the office who answers the phone and we can then… you know get down to business quite quickly and see what is happening. So I would have… over the years built a good relationship with all of those types of people and you know it's invaluable.

Interviewer:
102:31: Yeah.

Interviewee:
102:32: When you are trying to deliver on a new product stream, you get the insight because those guys are living in the country, to say, you know, what is the biggest one, what is the smallest one...

Interviewer:
102:42: Talk to me a little bit more about more about that ability to work with people and collaborate with the likes of Bord Bia… but also you have mentioned it a few times with the partnership with [redacted] and working with the retailer to get the product or the product design to fit perfectly on the shelf. Do you consider that to be...?

Interviewee:
103: 03: It's… I suppose the way I have evolved its… as I said I was fortunate enough to be involved in food quality at the very early stages when someone in food quality did everything. So you had to… you knew about… you were meeting customers, you were and say go back to my time in ABP… I was the onsite animal welfare officer. I was visiting farmers. I was then meeting with customers. I was then looking at what customers were doing with our product. Looking at the customer beyond the customer. So all of those relationships… they are absolutely vital. How do you develop and grow that skill set? It's a midfield because all of a sudden you're drifting into sales and marketing, you're drifting into process, you're drifting in to structure and production, you are drifting into support services and like I suppose from my perspective, it has been, it has been an evolution more than a revolution, you know, in going from… in learning what I have learned over the last number of years… Could I necessarily say that it has been anyone one individual thing that would allow me to turn around and say, you know what lads… that cheese line out there is not working hard enough; we need to be doing something different with that. You know… can we make square ones, round ones, pink ones you know, can we do something different and I suppose I would typically have the mantra of why not rather than why. So you have to… I think from dealing with those things, first of all, the R&D people have to put themselves in the way of work. Right. And that work might be difficult. You know I would have learned a huge

amount from my time in [redacted] dealing with the retailers but more so once I started dealing with them directly myself and not being told you know, by the MD there at the time and I learned a huge amount from him but I also learned an awful lot by what he wasn't doing. If you know what I mean.

Interviewer:
105:22: Yeah, yeah, yeah.

Interviewee:
105:23: And that would have been his particular style and the way he did it and it was his business and if you are the number one in the business it's a different kettle of fish being the number 2 or 3. It doesn't really matter if the thing tanks. You know you move on. The guy who owns the business, he can't go anywhere.

Interviewer:
105:40: Yeah.

Interviewee:
105:41: So he has to make it work. So from that perspective, you have to understand that there is a huge amount of interpersonal understanding due to the nature of the stresses and pressures on any one individual person. For instance, now when I was dealing with Tesco in my time in [redacted]. In my seven years, I think I dealt with 11 different buyers. They were changing, if not every quarter, certainly every half a year nearly. There was one or two that came back in once or twice. It was frightening… I remember talking to one lad who was a technical manager in Tesco and he would have done a lot of the third world work and sourcing product. I was saying how do you cope with that? And he said it is extremely difficult he said. You could have a conversation with a buyer on a Friday and by Monday morning there is a new buyer there. You didn't know, he didn't know. He probably got a text at midnight saying instead of buying cakes next week, you are buying sausages. You know that is it. They don't and that is very difficult to get a proper understanding of the process with the retailer. Now Tesco would be unusual in that regard because they do not want people making personal relations with suppliers because they get in huge hot

water with the amount backhanders and this, that and the other that was happening. Trade supports I suppose rather than backhanders is probably the more PC way of putting it. But how do you evolve that. You have to put yourself in the position that the NPD person I would say, needs to be at least one or two retailer meetings a year. They need to start understanding that they are not just doing a job for the sake of doing a job. They are doing it because the salesperson has to put it in front of this person on that time, on that date with a price on it and know that the price is at least on point with what the rest of what they are doing. So you need to have an understanding of cost, economics and also what I would term financial engineering. So you have an existing product, how can you get better margin out if it or how can you give the next person in the chain a bigger piece of the pie to encourage them to take that product. So the end price might not change but the intermediary price might be fluctuating. And the consumer won't know that. So you might be giving like we negotiated at one stage with Tesco a proper structure around everyday low pricing so we never have any promotional support on any lines but they were constantly on promotion on a rotation. I think it was four products in the range and it went right the way through each of the different promotional sequences… so you would have a spike and a spike and a spike and sometimes the general economics of looking at that doesn't make sense because why would we just give away margin? Well, you give away margin because you get volume and if you need volume to run a line because you need to pay the fees back on the line. Well then it probably makes huge sense to be able to turn around and for six months or 12 months or 2 years to be able to turn around and say right let's go everyday low pricing on this and you decide when we run promotions, you decide how hard the promotion is because you are funding it but I'll give you a price that is maybe 10 or 15% under the normal trading price so you are just functioning at a flat level and people need to be exposed to the different way that sales have to interact with customers. And even if they not at the meeting, they should absolutely be debriefed by the content of what is happening. When I was in [redacted] and we were talking about… and we did we bought some kit and we were about to launch a whole range of different pre-packaged fish products. I did a whole exercise… a whole project around buying the kit, buying everything. The packing, the wherewithal, the labels, the cardboard sleeves, whatever the different fish products, whatever. I had a range of 23 lines designed and developed for pre-packaged, flavoured, not flavoured, butter nuggets, all that kind of stuff and the owners of the business… they brought down an outside consultant who had worked with another fairly reputable domestic fish producer who had done

something similar. He went in and he went down through my costings and said yeah they are absolutely bang on, even down to the labour. He said you're actually 1% less labour costs than the other crowd that we were dealing with and I said that I had overestimated that to the tune of 4% because I knew in the initial period you were going to spend a lot more time wandering doing things until it was absolutely fine-tuned. Like I had a very straight forward process idea in my mind. Who was going to do what, when, where and how. And how it was going to manifest but in order to get that around to the owners of the business sometimes it is hard. They can't see it. I can see it clearly in my head as to how we are going to get from A to B but sometimes you then have to sell it internally. So there is selling externally but then there is the internal customer where you have to sell it inside otherwise you are not going to get that sort of money. We did a grant aid project that was somewhere just short of [redacted] and I had an R&D project sorted behind that which was probably of similar magnitude but we were talking about bringing in swordfish and slicing it and portion packing it for the barbecue trade in the summer. So we were doing things 5 or 6 years ago that, yeah there is a lot of people doing it now but that was all way ahead of it and I actually did a small bit of work with [redacted] after I left and a lot of their NPD now would come out of a lot of the ideas that I threw across the table at them. So there… the knowledge base that an NPD person has is probably as broad, if not broader than any other support system in the business

Interviewer:
112:21: Yeah.

Interviewee:
112:22: NPD needs to understand the maximum potential capacity of the process. If they don't know how to operate the machine, they need to figure it out. They need to know that, oh yeah if you turn that up it goes soft, if you turn it down it goes hard. Oh, that is interesting. Now I have any idea how I can put it into a different pack. Now instead of you know… packing it in a firm, single slug, you know we can now put it in a pot and it can be nice and soft and gooey. Like one of the things that I have looked at here or want to look at here is savory. Like we do all the sweet stuff. We do dessert. Let's go back a step you know. We can make quark; we can make sauces. We can do curry sauces, we can make, you know… we have a cooking room outside, we can cook

tomatoes, we can do pasta sauces. It's just a matter of herbs and it's just a matter of recipes. Put a second cooker up there. Have one for sweet and one for savory. At this stage now the whole place is full of warehousing. But why not? Again it's the why not. Just because you have or just because you always made such and such doesn't mean that you're going to be making... I mean in the time that [redacted] started, you know what was there. Nothing. So why would you make yogurt on a farm, you know. Sure it's preposterous, the idea. You're a farmer… you milk and get on with it. So somebody cracked the egg at some stage so you have to keep cracking that egg all the way along the chain. They need to have an element of financial acumen. Technological acumen so that they can deal with the problems and capacities and understand potentially even from a microscopic level what is actually happening. My time in [redacted], I changed all the recipes and we changed from a more standard emulsified product that I knew all of the technology around because I worked with it in [redacted] or in [redacted] in flour. So I knew exactly how all that technology functioned. So when I started talking and entertaining discussions with other guys about using enzymes in replacing certain attributes my knowledge was… you know I was nearly going woo ok let's see if we can do this. And we were the first bakery in Ireland and the UK. We weren't aware of anyone on the continent but we were certainly the first in Ireland and the UK that moved to enzyme technology.

Interviewer:
115:05: Ok.

Interviewee:
115:06: And I'd say we were probably two years ahead of anyone else. And we never told anyone and that was the biggest mistake that [redacted] made. We never told anyone. The worry was… if you tell them, they will know it's different and they won't like it. You know, and you're like, what do you mean they won't like it? They won't know the difference.

Interviewer:
115:25: Yeah.

Interviewee:

115: 26: And we proved that because we changed everything and nobody...

Interviewer:
115: 31: No comment.

Interviewee:
115:32: No comment. But I said we had made it better. We had taken out the sugar, we had given them a fibre source and some of the muffins we actually had a source of high fibre on the sale of the blueberry muffin. There was… it was high in fibre which means we were at 7 ½ grams of fibre per 100 grams. It was huge. But it was just a rebalance of the produce. We took all the saturated fat out because we didn't need all the emulsifiers now. The enzyme acted as the emulsification agent and so there was a whole load of new stuff there. We had great fun then when I sat down with the head technologist in Tesco. Trying to explain to them why when we started out with 100%, we ended up with 99.8. Where was the .2 gone. Because the enzyme was gone. It's not there anymore. So we added it at the start, it's not there at the end because once it got baked it died. Not that we have enzyme skeletons or anything inside in the middle of the cake. But you know what I mean. And they were challenged by it because nobody else had in… nobody out of I don't know how many thousands of suppliers that had… nobody had ever come to them and spoken about this so we were miles ahead of the curve. In terms of potential product new sales. It was huge, but again, we didn't take full advantage of it. Again, we had one customer in the UK and he came back to me one day and he said there is something wrong. I said what is wrong? He said your test results of the nutritional… they are all wrong. I said no they are not. He said they have to be. I said, why do they have to be. And it's the why not question again. Why are you questioning. And he said, but you're totally different, you are way better than anyone else and you taste better. And I said yes and… why, so he says this is unbelievable. And he said and you haven't told anyone. I said no, I can't tell anyone because that is not in the interest of the MD to be telling people and oh my god he said, I'm going to start telling people about this. I said absolutely, it's under your brand. We were doing it as a co-manufacturing product. I said it's under your brand absolutely… tell everyone. He said is there any other information. And I sent him stuff too and he said oh my god. What have you done with this? You have turned a very unhealthy product into a moderately healthy product you know.

Interviewer:
117:55: Yeah. That tastes better.

Interviewee:
117:57: And tastes better. It was smoother, lasted longer and because of the nature of the matrix we made… I got about 25% more shelf life on a product that I had already doubled in shelf life. So it was, from a technological perspective, it was fascinating. So commercial, technological, process and in the middle of all that you have got to manage people. Because you're the one in the middle of a room of engineering people. They don't want to know about problems because they have enough on their plate. Production, they are flat to the mat because of this, that and the other. Sales, they are not even on site. They are off somewhere else. And then you have got either the general manager or the owner of the business going… OHHH what is going on? So you have to be able to pull it all together and unfortunately, that means, so you have to have a certain amount of personality but to the point of… you are not there to be their friend. You are there to improve the process you know. So you have to be very clear on your own objective and roles and yeah there is one or two here that in speaking with them normally… that doesn't seem to get the message across so you have to you know… you have to change your tack. You have to talk to people through people as well and you have to convince them. It's a bit like dragon's den. You have got to make them see that this is the way forward

Interviewer:
119:20: Yeah.

Interviewee:
119:21: And unfortunately you don't have that when you come out of UCC with a food technology degree.

Interviewer:
119:27: Yes.

Interviewee:
119:28: You know. And like I suppose in one sense that probably puts me at a… in a kind of point of uniqueness in that I didn't qualify with a primary food technology degree. Having only done it subsequently and it was more of a very interesting thing. You know the whole quality management scene. The… you know, the facts and figures, the procedures and protocols so in my own head certainly and I endeavour to do it on paper and I intend it to be much more routinized and structured in what is happening in trying to make sure that we keep to timelines. From a sales perspective… that is what is vital. The problem you will have is dealing with suppliers, making sure that they deliver on what they said they were going to deliver. I need to have you know, X delivered by Wednesday. It doesn't come until Friday. No s******g good. You know, where is that. So you need to be able to deal with other people that are feeding you with stuff and to be able to react timely and why I mean by that is. Say for instance now, I know that I have a presentation in two and a half weeks' time and there are two or three suppliers that haven't come back to with what I have requested from them last week and so I now need to today, need to crank up the demand and say you know, I still don't have it. You haven't even come back to me. I need it, I need it, I need it, and create such an amount of urgency that I will have it by Friday and I will have next week then to work on it. So that is where I am looking at. I have another presentation on the 7th of October for the team. So you know, in one sense, if I don't get it sorted by the middle of this week. I am going to be absolutely up the swanny in terms of because I can see it three weeks out. I can see the timelines and I suppose I'm familiar with how those timelines should work. I only need two days at the very end. That is all I need. But I need three weeks to get prepared for two days. And everybody within the chain that I am managing has to be able to deliver on what they said they will deliver and if they can't and I'll say that to them quite bluntly at the start. If you can do it that is great. If you can't do it, you need to tell me now.

Interviewer:
121:51: Yeah.

Interviewee:
121: 52: So that I move on and I'm not waiting for you. And if can't do it but then subsequently find that you can do it. Delighted. Just send me a note to tell me it is on the way. But I have to

move on. So you have to be I suppose quite disciplined. You have to have a good appreciation of a quality system that is on site. Now a lot of people can learn about that in time but… and I'm sure there are certain modules on quality and that in the technology programs but you have to be a jack of all trades as far as I can see to make sure that you can deliver. Because you are delivering for everybody. You are not just delivering for yourself. Now you are… almost secondary but you are delivering for the owner, you are delivering for sales because they get the product to display. You deliver for engineering because you need to understand, if I can get steam from there to there if I can get air to push that thing up the hill if I can get, you know can the separator, can it separate it at 65 degrees instead of 25 degrees. What will happen to the product if I do that? What will happen if I don't do that and so you have to understand through every loop and I suppose at times, what can be difficult is working with the production people and saying when am I going to get these products done? And well Jesus I don't know. Because I'm busy. We got the ploughing next week, we got bloom the week after, you know. But you will always have that. I mean, if I get this launched, you are going to be even busier. So you need to figure out how you are going to move on to the next stage. And part of that then is to go back and look at the process and say well if we did this… this and this then you will be able to shrink your manufacturing time, your wash downtime and now you have an extra day a week. Because at the moment there is no extra day in the week. But I need to make at least one if not two extra days in the week which should be possible and in one sense then it's a matter of economies of scale in trying to produce enough

Interviewer:
124:00: Ok.

Interviewee:
124:01: So yeah, people person, technically, financially, and a little bit of street smarts or just a little bit of cop on. They are kind of the main attributes for somebody in this type of role and certainly in a small business. You go into the [redacted], you can be a superb technologist and you don't have to think about any of the other things because that is not your role. But unfortunately in a small business, you have to… even if you don't know all about them, you have to be able to, with say, with the financial controller, or with the cost accountant and say look I'm thinking about doing this, this is a recipe in the back of an envelope, would that work or what

would the price look like? How does it compare to the existing one? What would change? Would the labour cost change? Well, I don't know… well you have to talk to production. So this is where all those things and after a while if you know the process, then you will be very close to be able to make a decision, for instance, say at a trade show and a customer comes up and says can you make polka dot yogurt for me. And you should be able to say hmm yeah that is very interesting, you know I think we could or absolutely no, not a hope, we are not set up for that. However, if we got this particular piece of kit, then we could do it. So to understand what gear you have on site, and to understand what gear potentially, if you had a wish list to be able to write a list of 5 or 6 things. Because most of the pieces of kit that we are talking about here would be from [redacted] to [redacted] a piece so you know, you are not going to buy that out of general cash flow. So you are going to have to save or get a grant, or do something or split it or some form or way of getting it over the line. So yeah that would be some of the attributes that someone would need to have.

Interviewer:
126:11: Ok and last question. Do ye have a defined strategy moving forward?

Interviewee:
126:16: Not yet. But it is coming.

Interviewer:
126:17: Ok.

Interviewee:
126:18: Ok and it's coming out of some of what we have done with the grab'n'go, some of what we have done with the kid's yogurts and as well as that I feel that [redacted] would be fairly forward thinking and [redacted] and [redacted] would be very open to contribution from others. As in there was a consultant here. He is [redacted] and he would have… he would have a lot of knowledge about the general sales process and kind of bringing people along and that is exactly… a lot of it is down to timing as well. I mean he is working with the business with a number of months previous and I would not have been surprised if his suggestion was that you need somebody here doing NPD you know.

Interviewer:
127:08: Ok.

Interviewee:
127:09 But you need somebody who is more than just when I say more than just somebody out of college because as a small business we can't afford; we couldn't afford for me to be sitting here for two years learning.

Interviewer:
127:21: Yeah.

Interviewee:
127:22: You know that is way too expensive. So in one sense you have to kind of go up the value stream in terms of offering a job to somebody at a certain level who will come in and you know, on the basis on certain… we will say process determinants and so forth that I have done so far, I mean certainly I'm paid for this year. So suddenly I'm here for no cost.

Interviewer:
127:45: No cost, yeah.

Interviewee:
127:47: Like that in an awful lot of ways is huge as well as the ability to eke out from the likes of Enterprise Ireland a grant on key account, or not, key managers, or key personnel. But I would think that we should be utilising that grant for somebody who perhaps we identify to be on the ground in [redacted]. Or in [redacted] / [redacted] you know. And potentially they could become our European sales manager and you might end up with different jurisdictions. So there is… although there is not per se a strategy yet. I know we only actually went through a development document last week, myself and [redacted], the sales and marketing manager and It is putting a kind of a six-month construct around everything from start to finish of a project. Which I think is reasonable… it could be done shorter but it may take longer if you know what I mean.

Interviewer:
128:52: Yes.

Interviewee:
128:53: And it depends on some of the gate posts that you have. Can you get to the buyer? Like we had one particular buyer we needed, or we were looking for a meeting with and you know through personal circumstance of whatever things could get deferred by a month or a few weeks and you can't plan for that but you have to… your process needs to be able to cope for an extension to it. A lot of the retailers now only have a certain few windows of opportunity for listing. Like if you were in the Kellogg's of this world bracket you would get a chance to list products twice a year. 1st of September, 1st of January. That is it. If you don't have it ready to go, ready for market

Interviewer:
129:37: You wait.

Interviewee:
129:39: Yeah you wait until the next. So September to the 1st of January… that's not too bad. But if you hit the 1st of January and you haven't launched. It could be 9 months you know and you have probably missed the boat in terms of certain product development.

Interviewer:
129:51: Ok.

Interviewee:
129:52: In my time with [redacted] now we would have worked on a number of projects with Kellogg's. All only on theoretical development. But this is also how Kerry or how Kellogg's would have worked with other potential new suppliers. Like they came in and working with us and with other grant aiding that we got from Enterprise Ireland. The prospect was that if we got the right product fit for us and for Kellogg's we could have been on a double shift, we would have doubled our employment. You know you would have had maybe 50 new jobs in [redacted]. That was huge.

It would have brought in huge focus on process development, and organisational control, you know a number of the other things would have all just happened because Kellogg's were prepared to front up and pay for certain pieces of kit if it was a runner. Now half the time then they would say, oh yeah, of course, we will pay for that but if somebody else has done a similar trial and has the gear well then we would be biased to them and typically it was Bunk'n Biscuits in Scotland got the work but of the three projects we ran, the technical people were telling us that the products we made on certainly two of the… well it was equitable on one but certainly far superior on the other two.

Interviewer:
131:18: Ok.

Interviewee:
131:19: But for commercial reasons then they still went with the other. Phenomenal experience to go through, you know the... even down to the point that the project had, it was like, almost like a military grade code name you know. You know I think one of them had a code name Sonic. But you know, you all… you just knew and everything, all the samples were referenced with the code name so nobody knew what it was if you didn't know exactly what the project was and like one of the products was for the Italian market and that was it. So you know I would have got huge exposure than to the, to the commercial and technical people at Kellogg's and they have exactly the same problems that we have here. Only that it is just much bigger and maybe NPD have a bigger cloud, whereas Kellogg's know that they can't just keep selling cornflakes, they need something else. They need to get out of the breakfast market, I mean they are up at about… when is the perfect time for a bowl of Kellogg's cornflakes. I mean, genius you know and it's you know so they are moving away from being pigeonholed as a breakfast product so you know… so now it's all snack and it's all that so. And I think that as a food technologist, or as someone in NPD, you have to be prepared to say, well we all eat, well certainly in food, we eat so many times a day and then there are snacks. So typically there are three meals and then you have snacks in between or after so how are you going to match what you make with what we are doing. Do we start making yogurt bars, you know with chocolate, without chocolate, with stabiliser, without, with fruit, without. So you know there is any other number of things that when we start looking at the

consumption opportunities and how are we catering, are we even looking at them you know. Have we been looking at a breakfast market? Probably not to any great degree but our natural yogurt that people would be putting their own fruit with so you could say… yeah ok we are in the breakfast market. Certainly, the food service takes some of the… like almost all of the little jars that we make in natural yogurt go into the food service market because they go into hotels and they are individual portion control. Somebody has their yogurt and their muesli or whatever in the hotel but consequently, we don't sell the small natural jar, we don't sell them in retail, even though they are in retail pack because it's just not the right fit because if you were doing that at home you would buy the big pot. And you would have it because there are three people eating it or you're going to have it for the week for yourself so you're not going to buy the individual portion. Knowledge about your market is what that is about. And I think that it is just fascinating when you start looking at the different meals… the different opportunities when we start talking about being a dessert product so. We are in the evening meal and we are just at the end of the evening meal. We need to get back into the meat part, we need to get back into the lunch part. You know we are not really in the snack part because you can't really do snacks unless we have different format or different setup, you know different thickening, should we be in the soft cheese market, should we be in the… You know, and so all of a sudden I want to start making tiramisu outside there and so now we are making soft cheese, mascarpone type, Philadelphia type cheese. And now i have my base for my tiramisu. I have a machine that is very quiet and you know I want to start filling that line. So I'm thinking in different directions, perhaps then what other people would have and it's, will it work? Oh, it certainly would work. Can I make it work? Let's get the priority stream right. Let's get the value stream right. Let's pick off some of the low hanging fruit. Like the milk standardisation, the fruit manufacturing so we are knocking those off and now we are into active new product management. So to a certain degree, I have done a chunk of business or work in house. There is still more to do but certainly, we are getting some quick wins as well.

Interviewer:
136:00: Yes.

Interviewee:

136:01: So that people are saying oh yeah that is why we are doing this and that. You know, I want to start looking at some of the by-products we have. Like some of the by-products we have from cheese goes down the drain. So it is a protein-rich white product to flavour it, colour it, culture it. Maybe we will make it even more acidic and use the acidity then and you see that is what we are doing here is using the natural profiling of the product to be its own self-preservation as you know once you are in the pH of 4 bracket you know… once you keep it cool and keep it sealed and keep it clean then the chances are it will last 3 to 4 weeks. 3 threes if you're not so careful, 4 weeks if you're more than careful and that three to four-week hinge is the difference in having product on the continent and not. Because if you are at three weeks it's not long enough because it's going to take a week to get there and go through the whole distribution process and nobody is going to put it on shelf with two weeks to go. I think the yogurt category; they might put it in fresh fruit or something else that is being managed more actively but probably costs a bit more. So for me to get to a point I need that shelf life now to be able to expand on some of the other new ideas that we have and I'm very close to being able to validate that sort of stuff so you know that is kind of where I am and yeah I don't know what else to say to you.

Interviewer:
137:36: No that is good. Is that shelf life one of your biggest challenges looking forward?

Interviewee:
137:41: No because I know it is possible to do it.

Interviewer:
137:44: Ok.

Interviewee:
137 45: But you need to fix some of the supports before you, you can't just fix the shelf life because the shelf life is determined by the manner in which we handle fruit, the manner in which we handle yogurt.

Interviewer:

137:53: Everything within the process.

Interviewee:
137:56: Yes, so everything is feeding forward to that so it might be that you just have you know, you might have four production lines and one of them is a very open line and you might just need to get some engineers to get some work done and seal it up and close it down if you're getting good performance out of the other three but if you are using all four to make the same product then on a mixed match you can only work with the weakest chain. Ok so if the weakest chain is the one that is open you know that is causing you some microbiological issues on shelf life stability well then that is the one that you focus on and fix that. So yeah shelf life is a challenge but in one sense it is more overtly a challenge on the demonstration that it works. I have enough notable commentary from my perspective to be able to say, yeah I know it will work but I have to now prove it in a fundamental conditioned way so that the quality department will accept it so that marketing can stabilize all that and work specifically on doing that you know.

Interviewer:
139:09: Right that is perfect. I won’t take any more of your time.

8.8 Appendix VIII: SECONDARY DOCUMENTS - CASE ONE

Product Type: Dairy Products

Age (Years): 22 Years

Year Established: 1996

Employees: 50

Sales (€): 5 Million

Markets: Ireland and the United Kingdom

8.9 Appendix IX: REFLECTION NOTES - CASE ONE:

CASE ONE: NEW PRODUCT DEVELOPMENT MANAGER

NPD Manager Knowledge, Experience, and Education.

My first impression whilst interviewing the upper-level manager at [redacted] (Company) is that he seems to be the most competent out of all directors and upper-level managers interviewed. This comes across in the interview in a number of the following ways:

1. Through the significant depth and detail that he goes through when describing the different activities, the company has worked on and implemented. Through his description, I got a clear understanding of his complex role and his clear explanation led me to believe he fully understands what he is doing and why it is important. The level of detail clearly shows his expert knowledge when it not only comes to NPD but to what seems like any aspect of the business. He touched on and described numerous elements of the company and how each department affects NPD. The evidence is provided when he explains how *"when I talk about new product development, it is not purely about the next new yogurt or the next old yogurt. Whatever you want to look at it. It is also about how we are producing and what way we process here. I actually think that new product development or product development is so much about what you are currently doing and are you doing it to the best of what you can do it, knowing that you are competing right across Europe."* I believe this shows quite a comprehensive understanding of what his role looks like and his attitude to his work.
2. He is educated in chemistry and marine biology, a food and technology diploma in UCC and also a business management diploma in UCC also shows his quite advanced level of education. He also has a competent level of both engineering capabilities and scientific capabilities which are evident from his education, experience and his reliance of both in his daily role which is quite evident in the interview transcript.
3. The significant level of experience he has gathered throughout his career in other food companies is also clear. He has worked in a whole variety of areas within the food industry. His first job was as a quality manager role back in 1983. He then moved to Red Meat for 5 years. He then spent four years in Odlums in Kennedy Key and four years in James Daly's

in fats and oils and spread technology multiplication. He worked in confectionery then for 7 years in Coolmore Foods. Then was the plant manager for Rockwell down in Skibbereen for two years. He then opted to do some contract work with one or two organisations from a production process improvement point of view. He then moved onto refrigeration engineering for two years. Finally did some contract work again with other growing small businesses before coming to [redacted] (Company). This level of experience has brought improvements in process efficiencies, improvements shelf life, new products and what seems like a whole new ambition to the organisation.

4. Finally, the director advised I speak with the manager as a second interviewee and gave the impression that he is confident in the information that would be provided by the upper-level manager.
5. He has also been Involved in recruitment as he interviewed a candidate with the director through French. He was involved in this recruitment process only six months after being hired himself which also shows the level of trust and confidence the directors put in him.
6. The process innovations already implemented by the manager have already provided sufficient cost savings to pay for his salary. This is only 6 months after being hired also which I think speaks volumes about his capabilities and the value-add that he is offering to [redacted] (Company).

Cost Saving Attitude

I noticed that [redacted] (Company) seem to have a very lean attitude in the sense that they try to remove a lot of wasteful activities or tasks in their operations. Evidence of this is continuously provided by both manager and directors.

1. First, the director in the interview stated: *"if we can save a tiny percentage, it all adds up you know if I can save half a cent in every yogurt produced, that's a huge saving at the end of the year."*
2. They built their own energy conservation systems themselves by hand to save cost. This seems to be an attitude that is shared among LMT SMEs due to their typically low levels of available capital.
3. The manager had saved his salary in his first six months.

Learning Capabilities

What is quite evident from the discussion with the NPD manager is that they are consistently learning day by day. This learning is also coming about as they practice and experiment with the machinery that they operate. He makes this clear as he describes the need for the NPD team to be able to *"understand the maximum potential capacity of the process. If they don't know how to operate the machine, they need to figure out. They need to know that, oh yeah if you turn that up it goes soft, if you turn it down it goes hard. Oh, that is interesting. Now I have any idea of how I can put it into a different pack. Now instead of you know packing it in a firm, single slug, you know we can now put it in a pot and it can be nice and soft and gooey."* This DUI mode of learning refers to an organisation learning-by-doing, by-using and by-interacting which is reflected and is consistent among the learning styles of the other LMT SMEs interviewed.

Collaboration and Management structure

1. It is my understanding that [redacted] (Company) operates in a very collaborative manner as quite often it seems that managers are asked about their perspective and what action they think should be taken on different issues. The directors seem to rely quite heavily on their management team, which is no surprise as this is also common amongst the other LMT SMEs interviewed. There is a structure in the company that is commented on by the director as a flat structure which leads me to believe there is reliance on the management team. This management team almost reflects the bureaucratic organisational structure of a large organisation in layers of Financial; New product development; Quality; Dispatch; and Commercial Managers. All of which report to the directors.
2. It is also commented on by the upper-level manager that he feels that "[redacted] (Company) *would be fairly forward thinking and* [redacted] (Director) *and* [redacted](Second Director) *would be very open to contribution from others"* which highlights the collaborative and cooperative approach to their operations.
3. Finally, I got the impression that [redacted] (Company) is a very honest company. This belief is reinforced by how they seem to treat their staff. Many of the employees have been working at the company for quite long periods of time which suggests that the employer-employee relationships are quite positive. Additionally, the high moral and ethical

standards that they implement and hold themselves accountable to are quite admirable. This is further described and supported by the manager at [redacted] (Company).

4. Government Agencies
    1. ***Bord Bia*** - Similarly to most if not all LMT SMEs operating in the food sector, [redacted] (Company) hold Bord Bia in great esteem. They depend on them for information, networks and various supports such as those provided by Origin Green when it comes to sustainable food production.
    2. ***Enterprise Ireland*** - Similar to Bord Bia, ye not quite held in as high esteem is Enterprise Ireland. They are typically relied on for grants, information (such as described by the manager when it comes to issues like Brexit) and networking opportunities. However, in this case, the director criticised E.I as he found it quite difficult to get information on how to take advantage of funding opportunities and tax credits. Thus what was highlighted was that they don't take advantage of Enterprise Ireland's offerings as often as Bord Bia.

Strategy

What seems to be quite clear is that [redacted] (Company) doesn't have a clearly defined strategy in terms of how they are going to grow. They made it clear to me that they know and are very aware that they need to grow and aim to grow by about 6-8% every year. However, they do not have a clearly defined strategy in terms of how they will achieve this. They haven't explicitly stated what they must do, who will do it when it needs to be implemented, and how effective is it likely to be. What the director did outline was that they do have a marketing strategy. When probed a little on this he outlined that they need to allocate a greater budget on their marketing activities. However, it seems like a general strategy he has in his mind that is not written down and explained clearly in terms of a defined strategy.

Customer Focus

[redacted] (Company) have a strong customer focus in the sense that they gather data from a significant dataset. Throughout the manager interview he stated that *"recently, we had over 500 people involved in a variety of tasting between Cork and Dublin, 250 in each location and within each location, each of the groups was either* [redacted] (Company) *buyers or not* [redacted]

(Company) *buyers. That is how they were categorised. Looking at the demographics, looking at the information. Looking at what they would like."* However, what surprised me was that the director said that they *"do not hang their hat"* on their customers and so they do not always act on the information that they gather. This surprised me as I would feel that it may be a better strategy to listen more carefully to the information received from these customers and act more directly on the data extracted from these tastings. It was highlighted that only 1 out of 10 products launched actually succeeds. Success meaning that the product is still on the market after one year. To improve this success rate it may make more sense to have a more rigid decision-making process based on customer feedback rather than making decisions based on gut feeling which still seems to be evident, not only at [redacted] (Company) but across other LMT SMEs in the food sector also.

Marketing Capabilities

Another aspect mentioned by the director was that he believes that their brand development in association with marketing companies has been one of the best marketing decisions they have made as it changed the business presence. What he also outlines is that they put a huge focus on marketing in [redacted] (Company). Their resource constraint was highlighted as he outlined how they have to do it in very clever ways that don't cost a lot of money. However, in the same breath, the director also admitted that he struggled with spending on marketing. He explained how he *"comes from a background where am, you know marketing for me is to spend without being able to measure how it has worked or not."* This highlights their reluctance to spend money on things that they struggle to measure. Interestingly this highlights a risk-averse attitude which was quite evident in numerous other instances also evident in the interview transcript.

Product Shelf Life

What seems to be quite clear is that the shelf life of the product has been a major inhibitor to the growth of [redacted] (Company). They are unwilling to reduce the quality of their products by adding preservatives to extend the product shelf life which would have them exporting to other countries. They outline how this is a major challenge which they have not been able to get around in the past. One of the directors is particularly strong on keeping this standard and is unwilling to change their view. I get the impression that this is really being driven by the directors as one director outlines how this view is different from some of the managers and definitely different

from sales staff as they are pushing for export markets. One director seems to be particularly strong when it comes to a clean natural farmhouse product. However, this challenge is now being overcome through the scientific capabilities that accompany the NPD manager who is confident in his ability in increasing the problem of a short shelf life that currently exists. Significant evidence of his confidence that he will get around this issue is given in the interview transcript.

Facility Development

Similar to other LMT SMEs, [redacted] (Company) is building on to their factory.

1. They are building a visitors centre where they could facilitate tours of their factory. They often do this for school tours. This highlights the moral and ethical standards that they hold themselves to while also giving back to the community not just in employment but also by educating school tours on the manufacturing process at [redacted] (Company) and how a simple farm product can be turned into so much more.
2. They have also launched a pop-up cafe with the increase in space where they sell their own yogurts, cheesecakes, coffees and so on creating a great atmosphere on their premises.